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CAVALRY IN ATTACK AND DEFENSE.*

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"No army can enter the lists with a fair chance of success, unless it has a cavalry that can both ride and fight."— *Wilson*.

THE characteristics of cavalry have already been generally considered; the tactical handling of this arm will now be more particularly discussed.

THE CHARGE IN LINE.

Formation.—The charge in line is made in close order, boot-to-boot, the forward movement increasing in rapidity until it finally terminates in a shock delivered at full speed. The effect of the shock depends upon the cohesion, weight, and speed of the charging force; in the *mêlée* which follows, the result depends upon the weapons of the trooper, and his skill in their use.

Whether victorious or unsuccessful, cavalry is invariably disordered by the shock and succeeding *mêlée*. In small bodies the disorder is of short duration, but in large masses it lasts a long time, the confusion of broken ranks being increased by wounded and

* From the advance sheets of "Organization and Tactics," by permission of the author.

riderless horses, as well as by troopers who have lost their weapons and become separated from their tactical units. If, then, cavalry were to charge in a single line, it might, while disordered by its own success, be easily overthrown by even a small body of hostile cavalry attacking in close formation and well in hand. To guard against a counter-charge, a support is, therefore, necessary; and this support must not be immediately in rear of the attacking line, lest in case of the defeat of the latter, it be thrown into confusion or ridden over by the retreating troopers, who almost invariably break straight to the rear. Moreover, the flanks being dangerously weak points in cavalry, the support must be so placed that it can readily attack the flank of the enemy, or protect that of its own attacking line. It should, therefore, be echeloned on the flank which is more exposed to the enemy's attack, or from which it can better operate against the flank of the hostile cavalry. Either to assail or defend a flank, the support is almost sure to be drawn into the *mêlée*, and a reserve must, consequently, be at hand to decide the victory, to ward off an attack upon the first line while disordered by the charge, to pursue the enemy, or cover the retreat. The reserve may be a considerable distance in rear of the attacking line, with wide intervals to admit of the retreat of the latter, but it is usually echeloned on the opposite flank from the support. When this flank is covered by other troops or by natural obstacles, the reserve should ordinarily be on the same flank as the support, and echeloned on the outer flank of the latter. In general terms, the support and reserve should be so disposed that the attacking line may be relieved from all anxiety in regard to its flanks, and devote its whole attention to the enemy in its front. In a cavalry combat, that force which can bring into action the last formed reserve is almost sure to be victorious. At Wagram, GROUCHY drove back ROSENBERG's cavalry with great slaughter; but HOHENLOHE's cuirassiers fell upon the disordered French horse, and would have swept it from the field, had not MONTBRUN brought up a fresh cavalry force and defeated HOHENLOHE in turn.

In a small force, the duties of support and reserve are combined in a single body, part of the support being kept unbroken and held well in hand when the rest is launched into the fight; but in general, an attacking force of cavalry consists of an *attacking line*, a *support*, and a *reserve*. The attacking line must be strong, for if it fails, the rest can generally do no more than prevent a complete reverse; but if too much of the force be placed in the attacking line, the lack of a proper support and reserve may cause it to be defeated while in

disorder. As a rule, the attacking line should consist of one-half of the strength of the entire force, the support varying from one-fourth to one-third, and the reserve accordingly from one-fourth to one-sixth. Troops and, if possible, squadrons should be preserved intact in each line; though one or more platoons of a flank troop may be echeloned on its outer flank, and in small bodies the reserve and support may both be taken from the same troop.

The distances between the lines, or echelons, vary with the size of the attacking force. In the case of a troop, the distance from the attacking line to the support is about eighty yards, and from the support to the reserve not more than 150 yards. In the case of a brigade or division, the former distance is about 275 yards, and the latter from 150 to 200 yards. If the flank of the attacking line be seriously threatened, the support may close to not less than 100 yards. The inner flank of the support should be from fifty to seventy-five yards beyond the outer flank of the attacking line. The inner flank of the reserve is generally at a similar distance beyond the other flank of the attacking line. If there be no reserve, a portion of the support may be placed, with wide intervals, in rear of the attacking line.

Even though the attack be made in line, small columns are the proper formation for maneuvering cavalry. They possess greater mobility and flexibility than the line, present a smaller target to artillery fire, and admit of the easy passage of obstacles and the utilization of sheltering features of the terrain. In moving forward to attack, the attacking line should be formed in line of columns of fours at full interval. The deployment into line must be made at the right moment; if delayed too long, the attacking body may be itself attacked before it is in proper formation; if it be made too soon, there is less chance of surprise and greater exposure to loss, and changes of direction in line, which always impair the cohesion of the attacking body and weaken the force of the shock, may become necessary. The support should also be in line of columns of fours at deploying intervals, and its movements should conform to those of the attacking line. The reserve is similarly formed. If, in issuing from a defile, forming on right or left into line, or changing front, time does not admit of completing the formation, each troop or squadron may be advanced to the attack as soon as it is formed.

In most armies, each part of the charging force is formed in two ranks. In our service the charge is made in single rank. There is a decided lack of unanimity in the views of the best authorities on this subject. The advocates of the single rank formation claim that

the rear rank generally merges into the front rank in the course of the charge, thus producing a charge in single rank; that where this merging does not take place, the rear rank is useless; and that casualties are increased, and the rear rank thrown into confusion, by the disabled men and horses in the front rank being run over. On the other hand, it is claimed that a line invariably loosens out in the charge, and that a charge boot-to-boot is impossible unless there are men in a rear rank to push forward into the vacant spaces created in the first.

Pace and Conduct of the Attack.—In moving to the attack, unless time is urgent, the walk is maintained until the zone of effective artillery fire is entered, when the trot is taken and continued until within from 1,200 to 800 yards of the enemy. The columns then deploy into line and take the gallop, gradually increasing in speed until within seventy-five to fifty yards of the enemy, when the charge is sounded and the line rushes forward at full speed, the men yelling and the trumpet sounding.

In former times, the charge did not extend over more than 800 yards including the walk, trot and gallop; but owing to the long-range guns and rifles of the present, large bodies of cavalry cannot often be held in hand without great exposure at a less distance than 4,000 yards from the enemy. With small bodies the distance may, of course, often be much less; but the distance is generally so great, that it is now conceded that cavalry, to be worthy of the name, must even be able to pass over four or four-and-a-half miles at the more rapid paces (trot and gallop), and then have enough energy left to make a charge and carry it through.

On open ground the rapid advance must naturally begin at a greater distance than when sheltering features of ground protect the cavalry from the enemy's fire. Against formed cavalry, the trot should be continued to within a few hundred yards, in order that the cohesion of the line and the simultaneity of the shock may not be destroyed by a long gallop. The gallop, in fact, should not, as a rule, begin sooner than may be necessary to give a proper impetus to the charge; for a long gallop distresses the horses, and when they are blown and exhausted the cavalry is at the mercy of the enemy. In *PONSONBY'S* famous attack with the Union Brigade at Waterloo, he charged with great gallantry through and through the columns of French infantry (which had recoiled from the attack on *WELINGTON'S* left), reached the great battery in the French position, and was sabering cannoneers and horses, when, just as the force of the charge was completely spent, he was struck by the French lancers

and cuirassiers. The exhausted cavalry was completely and easily overthrown, the French horsemen making mere sport of overtaking and dispatching the retreating British troopers.

When the attacking line charges, the support takes the full gallop; and when at a proper distance, it charges against the flank or an intact organization of the enemy. The reserve is not habitually thrown into action except to meet an unexpected flank attack, or take advantage of an opening to strike the enemy on the flank. In a large force—such as a brigade or division—the reserve takes advantage of natural obstacles to screen itself from the view and fire of the enemy; but it must not lose sight of the attacking line or of the commander, nor must it get so far to the rear that it cannot respond quickly to his orders. If in column, the reserve forms line of columns at deploying intervals when the attacking line charges, and it assumes the functions of the support when the latter charges.

In the charge, the officers lead, except when the revolver is used, in which case they take their positions on the flanks or in rear of their subdivisions. Every unoccupied detachment of cavalry near the charging body should join it without orders to do so, unless it has been stationed at a certain point for some particular object. Even then, the commander of the detachment must decide as to which is his paramount duty in the case, and must be prepared to accept the consequences of any error of judgment on his part. An error inspired by zeal and bravery is generally easily pardoned.*

In all cases, and especially when infantry is the object of the attack, the enemy should be shaken by artillery fire (generally from horse batteries), which should be continued until the charging cavalry masks the front of the guns.†

When the charge is successful, the enemy is pursued by the support and reserve, the first line rallying and acting as a support to the pursuing force. In the case of an unsuccessful charge, the attacking line should so withdraw as to avoid collision with the support and reserve, which should both attack the pursuing force in flank. The attacking line then rallies, and comes up to act as a support to its former support and reserve.

Influence of the Terrain.—The influence of the terrain is greater

* In the great cavalry battle at Gettysburg, Captain MILLER, of the Third Pennsylvania Cavalry, seeing an opportunity to strike WADE HAMPTON'S column in flank as it was charged in front by CUSTER, turned to his first lieutenant with the remark: "I have been ordered to hold this position, but, if you will back me up in case I am court-martialed for disobedience, I will order a charge." The charge was opportune and effective, and no mention of a court-martial was ever made.

† See the chapter on Artillery Tactics.

upon the action of cavalry than upon that of infantry, though less, perhaps, than in the case of artillery. The Germans train their cavalry to charge with unbroken ranks over ditches, low walls, and broken ground; but such riding is possible only with a cavalry that is acknowledged to be the most carefully trained in the world. Plowed ground, heavy sand, and wet and swampy soil, will retard, and in some cases check, the charge of cavalry. It is a mistake to suppose that open, level, ground is the best for cavalry action; for on such ground surprise is impossible, and the fire of infantry and artillery has an unbroken sweep. Undulating ground, if not broken by woods, inclosures, or other obstacles, is the best, as it affords very considerable shelter without impeding the force of the attack. A charge may be made down a slope of less than five, or up a hill of not more than ten degrees. A combination of open and inclosed ground is favorable for a cavalry attack, provided that passages exist by which the columns may go from one clear space to another, and open ground suitable for the charge exist immediately in front of the place of collision. The worst possible ground is that which impedes the progress of the cavalry without affording shelter from the enemy's fire—such as the ground over which MICHEL's cuirassiers charged at Wörth, where "rows of trees cut down close to the ground, and deep ditches, impeded the movement of large bodies in close formation, whilst the infantry had a perfectly open range over the gentle slopes of the otherwise exposed heights."*

The extent of the ground will have a great influence on the formation of the attacking cavalry. For a charge in line, there should be room enough laterally for deployment and for flank attack; failing this condition, the charge must be made in a different formation. In any case, there should be room enough to the front to enable full headway to be gained for the charge, and for the *mêlée* and rally; and to the rear there should be no insurmountable obstacle on which the cavalry, in case of reverse, might be forced back.

Ground Scouts.—A knowledge of the ground is imperatively necessary for the cavalry leader, for a charge made over unknown ground frequently results in serious disaster independently of the efforts of the enemy. At Shiloh, FORREST charged against a body of United States infantry, and came within forty paces of them when he found his progress checked by an impracticable morass, in which the horses became entangled and from which some of them could not be extricated. The charge thus came to naught without any damage whatever having been done to the opposing infantry. In a

* German official account.

similar manner, the Prussian Fourth Hussars, at Königgrätz, charging over unknown ground, came, while in full gallop, upon a gully which had been concealed from view by the high standing grain, and nearly all were precipitated headlong therein, the charge thus coming to a disastrous end.

To avoid such accidents, ground scouts should be sent forward to reconnoiter the ground. These men, who should be selected for their intelligence, daring and power of quick observation, move at a considerable distance to the front, and communicate by signal with the commander. The duty is an extremely hazardous one, but the occasion generally demands it, and even if all the scouts should be killed or wounded, the loss would be justified by the preservation of the command from disaster. When the charge begins, the scouts clear away from the front at a run, and take position on the flanks. In many parts of the United States it would be found necessary to equip the ground scouts with nippers with which to cut wire fences. Combat patrols consisting of two or three men each, should be sent out to the flanks to give timely notice of threatened attacks by the enemy. The men composing these patrols should have the same qualifications as the ground scouts. Whenever a body of cavalry halts in the presence of the enemy, it should send out ground scouts and combat patrols at once.

Flank Attacks.—Of cavalry charges it may be said without material error, that only flank attacks give decisive results. Indeed, as VON SCHMIDT declares, ten men on a flank are worth more than a hundred in front; and all cavalry movements in the charge should aim to strike a hostile flank either directly or in conjunction with the front attack.

The flank attack may be made either by a portion of the line overlapping that of the enemy and wheeling inward, or by a detached force making a direct attack upon the hostile flank. The former method is dangerous when the force does not exceed that of the enemy; for in order to overlap with one flank, the other must be similarly exposed to the enemy. The second method generally produces the most decisive results, but it can be effected only by surprise. This, however, is not always difficult, as by utilizing the various features of the terrain it is often possible to get within a comparatively short distance of the opposing force without being seen; and this is especially the case when the attention of the hostile troops is taken up with a body of menacing cavalry in its front. Opportunities for direct attacks upon a flank are often presented by a body of cavalry engaged in an attack. At Gettysburg, a charging column

of Confederate cavalry, consisting of the brigades of FITZHUGH LEE, HAMPTON and CHAMBLISS, while opposed in front by CUSTER with only a single regiment, was assailed in flank by several regiments of Union cavalry, and driven back.

A charge on the enemy's flank in conjunction with a front attack is more effective just after the clash of the two opposing lines than when simultaneous with it. The two lines rebound from the shock, horses frequently being turned "end over end" and crushing their riders underneath them, and the opponents then interlock in a *mêlée* which often lasts only one or two minutes, and rarely continues more than five or ten. If the flank attack can strike just at the moment of the rebound from the collision in front, it may ride down the disordered line, and sweep it off the field before it has a chance to recover from the first shock.

Time for Attack.—In a cavalry charge the first consideration is that the attack should be opportune. A timely attack in a poor formation and over unfavorable ground is worth more than the most perfectly prepared and conducted charge made either prematurely or after the "golden moment" has passed. If the attack be made too soon, the enemy will be found unshaken and unsurprised; if made too late, the confusion, bad position, or other unfavorable circumstance, of the enemy will be found remedied, and the opportunity will be lost. By a charge in the nick of time, KELLERMAN with only four squadrons, saved the day for the French at Marengo. MARMONT, who was an eye-witness of the attack, says that a difference of three minutes sooner or later would probably have rendered the charge useless.

It is necessary, therefore, that a cavalry leader should be a man of keen observation, quick decision, and such resolution that he will never shrink from taking the initiative when the fleeting opportunity for a successful charge presents itself. Good cavalry leaders are the rarest of all military men.

THE CHARGE IN COLUMN AND AS FORAGERS.

When not made in line with support and reserve in echelon, the charge should be made in a column of subdivisions, the distance between which should be such as to admit of each rendering timely support to the one in front, without being so close as to be compromised in its defeat. Until the time of deploying for the charge, the rear subdivisions should be in small columns, so as to leave openings for the first line in case of defeat. The subdivisions charge successively, the leading unit if repulsed or broken by the shock, endeavor-

oring to clear the flanks of the column and form in rear. The charge in column of subdivisions may be made in column of platoons, column of troops, column of squadrons, or in a line of such columns. A charge in column of subdivisions gives a succession of shocks falling in the same place, and is preferable to the attack in line, unless the latter offers an opportunity for an attack on the hostile flank, either direct or in conjunction with a front attack.

It is of vital importance that the subdivisions be not too close. At the battle of Sohr (September 30, 1745), fifty Austrian squadrons were formed in three lines, with distances of only twenty yards. The Prussian cavalry charging them squarely in front, threw the first line in confusion upon the second, and the combined lines upon the third, and swept the whole mass in disordered rout from the field.

The charge in column of subdivisions was frequently used in the War of Secession, the most celebrated instance of its use being at Gettysburg, where the brigades of HAMPTON and LEE, charging in close column of squadrons, were met by CUSTER in the same formation. On this occasion the especial weakness of a charge in this formation—the exposure of the flanks—was also manifested. It is with a heavy and dense column of cavalry as with a similar column of infantry. It cannot be actuated by a single impulse, and every trooper added to increase its mass adds to the number of individual wills it contains, and the number of individual impulses of self-preservation to be overcome. Its progress depends mainly on the courage and skill of the few men in front, who cannot easily be pushed on by those in rear without incurring disorder, while the fall of a single trooper in the column is likely to throw into confusion all in rear. If the column were a solid body influenced by a single mind, its force would be in proportion to its mass; but under actual conditions, none but small columns can, as a rule, be used.

Nevertheless, charges have been made successfully in column of fours, even by forces as large as a regiment; and the nature of the terrain may often be such as to present the alternative of using cavalry in this formation or not using it at all. At Boonsboro, Md., in 1862, Colonel W. H. F. LEE, in command of the Confederate rear guard, charged with the Ninth Virginia Cavalry in column of fours, through the streets of the village, where no other formation was possible, and succeeded in his object of checking the Union pursuit. In this charge, a considerable interval was left between the squadrons, and each, as it was broken by the shock of the charge, returned to the rear and re-formed, the attack thus taking the form of a series of shocks. A similar charge was made by the Third Virginia Cavalry

at the battle of Kelly's Ford, in 1863. Many other instances in the same war might be noted.

In charging in column of fours, each four takes the extended gallop when the one next preceding has gained the distance of one horse's length. The charge may be made in double column of fours, when the ground does not admit of a charge on a wide front, and the front of a single four seems inadequate. In such a case, the saber and revolver might be combined, the men on the left flank of the column using the latter weapon, as the left is the weak side of a swordsman.

The charge as foragers may be made from either close-order or extended-order line, the troopers using either saber or revolver, and charging in couples with intervals of about six yards. A reserve consisting of not less than one-fourth of the command should be kept in hand in close order. This method of charging is adapted to wooded and broken ground, and is also employed to lessen the target presented to infantry or artillery fire, to annoy and occupy the enemy for the purpose of gaining time for the deployment of troops in rear, or in pursuit of a defeated enemy. If the enemy's cavalry turn and break without awaiting the shock, the charge may be checked and a rapid pursuit be made by foragers, the rest of the command following in close order.

CAVALRY AGAINST CAVALRY.

While the use of cavalry against the other arms on the battle-field will, probably, not be so great as it was formerly, the number of cavalry battles will doubtless be much greater. The success of a campaign depending upon proper screening and reconnoitering duty, and this in turn depending upon the superiority of the cavalry over that of the enemy, each army will strive at the outset to overthrow the mounted force of its opponent. Hence, as so often prophesied, the next great war will begin with a cavalry battle of considerable magnitude. Moreover, the constant attempts to break through the screen of the enemy, and to thwart him in similar attempts, will lead to continual encounters between the screening troops, until finally, when the armies arrive within the presence of each other, the cavalry of each will uncover the front, and withdraw to positions on the flanks. From these positions, the cavalry, accompanied by horse artillery, will endeavor to gain the flanks, or even the rear, of the enemy, for the purpose of creating a diversion; and it will aid and support every attempt to attack the enemy's flank, and use every endeavor to prevent similar attacks in return. This will often lead

to such great cavalry combats as those on the flanks at Gettysburg and Mars-la-Tour.

Again, it being the duty of the cavalry of a defeated army to cover the retreat, and of that of the victor to conduct the pursuit, almost every great battle will close with an engagement of cavalry. At Eckmühl, forty Austrian squadrons fought the French cavalry for more than three hours, and thus gained time for the Archduke's army to retreat across the Danube. At Königgrätz, when the Austrian army was shattered by the concentric attack of the Prussians, when most of its guns had been captured, when its infantry was in full flight, and its line of retreat was threatened, its cavalry threw itself upon the pursuing cavalry of the Prussians, and, under cover of the long struggle which ensued, the defeated army withdrew in safety across the Elbe. "It is beyond a doubt," says HOENIG (a Prussian officer), "that this cavalry knew the fate which awaited it, surrounded as it was on three sides by the fire zone of breech-loaders. It was sure to be defeated at last, but the well delivered stroke had a tremendous tactical effect. It relieved the pressure on the retreating army and saved it from the utter rout which would undoubtedly have followed if the Prussian cavalry had remained master of the field, or had not been attacked as it was. This is not a case for flattering national sentiment, but for reviewing the events calmly, truthfully, and justly, and anyone who considers the attacks of the Austrian cavalry in this way will unhesitatingly conclude that it carried out most successfully one of the most difficult tactical duties which has ever fallen to the lot of cavalry. Cramped and shut in, it attacked the Prussian cavalry, in spite of a ceaseless flank fire of breech-loaders, forced its way right up to the infantry line of an army already intoxicated with the assurance of its great victory, and brought the whole Prussian line to a standstill."

The best opportunities for a cavalry attack upon the enemy's cavalry is when the latter is issuing from a defile and presents a narrow front; when it can be surprised in a column formation; when it can be taken in flank while charging another body; when it is exhausted; while it is changing formation, or when it is on ground unfavorable to its deployment. In the latter case, the ground, while unfavorable to the deployment of the enemy, must, of course, offer no obstacle to that of the attacking cavalry—for instance, the enemy may be emerging from a wood into an open plain on which the attacking cavalry can readily deploy, while the enemy's deployment is still obstructed by the wood.

It is evident that the combats of cavalry with cavalry will gener-

ally be fought by the cavalry divisions. The divisional cavalry will habitually be used in conjunction with the other troops of the division, and will rarely be engaged in a pure cavalry fight, except when united with the cavalry divisions in screening duty, in the pursuit, or in covering the retreat, or when employed in defending the divisional artillery from an attack by the enemy's cavalry.

CAVALRY AGAINST INFANTRY.

While it may be set down as an axiom that good, intact, infantry, plentifully supplied with ammunition, and not taken by surprise, cannot be broken by a cavalry charge, however gallantly made, the fact remains that many opportunities will still be presented in war for the use of cavalry against infantry; for infantry is not always good, it is not always intact, it is not always supplied with ammunition, and its surprise, though more difficult than formerly, is still by no means impossible. Cavalry may be used with effect against infantry under the following circumstances:

I. *When the infantry is demoralized or of poor quality.*

Inferior infantry is not only unable to deliver the effective fire on which the defeat of a cavalry attack depends, but it is susceptible in the highest degree to the moral effect produced by the charge. A notable instance of the effect of a cavalry charge upon inferior infantry is furnished by the battle of Somosierra (Nov. 30, 1808). It is best described in the words of NAPIER: "At daybreak three French battalions attacked ST. JUAN's right, three more assailed his left; as many marched along the causeway in the center supported by six guns. The French wings spreading over the mountain side commenced a skirmishing fire, which was well returned, while the frowning battery at the top of the causeway was held in readiness to crush the central column when it should come within range. At that moment NAPOLEON rode into the mouth of the pass; his infantry was making no progress, and a thick fog mixed with smoke hung upon the ascent; suddenly, as if by inspiration, he ordered the Polish cavalry of his guard to charge up the causeway and seize the Spanish battery. The foremost ranks were leveled by the fire of the guns, and the remainder thrown into confusion; but General KRAZINSKI rallied them, and, covered by the smoke and the morning vapor, led them sword in hand up the mountain; as they passed, the Spanish infantry on each side fired and fled toward the summit of the causeway, then the Poles took the battery, and the Spaniards

abandoning arms, ammunition and baggage, fled in strange disorder. This exploit, so glorious to one party, so disgraceful to the other, can hardly be matched from the records of war. It is almost incredible that a position nearly impregnable, and defended by twelve thousand men, should from a deliberate sense of danger be abandoned to the wild charge of a few squadrons which two companies of good infantry should have effectually stopped. * * * The charge viewed as a simple military operation was extravagantly rash; but as evincing NAPOLEON's sagacious estimate of Spanish troops, and his promptitude in seizing the advantage offered by the smoke and fog which clung to the side of the mountain, it was a felicitous example of intuitive genius."

II. *When the infantry can be taken by surprise.*

At the battle of Custozza (June 24, 1866), a squadron and a half of Austrian lancers surprised an infantry brigade, and so completely routed four of the five battalions of which it was composed, that they were of no further use in the battle.

During the German autumn maneuvers in 1879, a regiment of lancers charged suddenly from behind some rising ground, and surprised four battalions of infantry, who did not see them until they were on the flank only two hundred yards away, and in full charge. Scarcely a shot was fired, and the Emperor and VON MOLTKE ruled three battalions out of the fight.* In other words, it was decided by the highest military authority in existence, that 3,000 good infantry, taken completely by surprise, could be routed by 600 cavalry.

III. *When the infantry is out of ammunition.*

At the battle of Eylau (February 7, 1807), AUGEREAU's corps, while its fire-arms were wet with the falling snow, was attacked by a large force of Russian cavalry, aided by a heavy artillery fire, and was almost annihilated. An infantry force at the present time could not, it is true, be at all affected by wet fire-arms, but it is liable to exhaust its ammunition, and it will then be as helpless as the infantry of AUGEREAU. With the exhaustion of its ammunition, infantry is set back six centuries in its efficiency, and becomes a tactical anachronism of which the cavalry can take advantage.

IV. *When the infantry is broken by the fire of the opposing infantry or artillery.*

At Austerlitz, the infantry of BAGRATION having been long engaged with the infantry of LANNES, was charged by KELLERMAN's cavalry and driven from the field.

*MAURICE.

V. *When the infantry is engaged with opposing infantry.*

At the battle of Winchester (September 19, 1864), the Confederate infantry, while engaged with the United States infantry in front, was struck in the flank by MERRITT'S cavalry, and routed with great loss.*

VI. *To compel the infantry to take up such a formation as to present a good target to the fire of the opposing infantry or artillery.*

Near Almeida, in 1811, a brigade of French infantry was attacked by a British force consisting of six squadrons and a battery of horse artillery. Continually menaced by the cavalry, the brigade was compelled to form squares, thus presenting a target on which the battery played with such deadly effect that the French were compelled to withdraw with severe loss. This mode of action will be profitable when the infantry is in extended order with unprotected flanks, and its use in future wars will probably not be rare. When the employment of cavalry is combined in this manner with that of infantry, it is necessary that the latter arm be used with vigor.

VII. *To check an attack of the enemy's infantry and gain time for the arrival of reinforcements.*

This is one of the most important duties, and certainly the most dangerous one that cavalry can be called upon to perform, and it should never be required, except when the necessity of gaining time is so imperative as to justify the sacrifice of the troops making the attack.

At Chancellorsville (May 2, 1863), when STONEWALL JACKSON had struck the flank of the Eleventh Corps, and was sweeping everything before him in dire confusion and panic flight; when any sacrifice was necessary to stem the torrent of disaster; a charge by the Eighth Pennsylvania Cavalry, under Major PENNOCK HUEY, upon the advancing Confederates, though repulsed with great loss, gained time for General PLEASANTON to assemble a battery of twenty-two guns, with which JACKSON'S onset was checked. Probably no more valuable use of cavalry was made during the entire War of Secession.

A similar, but much more celebrated charge, was made at Mars-la-Tour (August 16, 1870). The Germans, in inferior numbers, were struggling to hold their own until reinforcements could arrive. CANROBERT'S corps completely overlapped BUDDENBROCK'S division, and a flank attack by the French seemed imminent. In order to

*See preceding chapter.

secure a point of support for his menaced flank, BUDDENBROCK accordingly endeavored to occupy some wooded and broken ground to the front with his main body; and the greater part of his division was there engaged in an obstinate fight with the French infantry, when he was informed that another French corps was coming up on the right of CANROBERT, thus doubly increasing the danger of a flank attack. It was now necessary at any cost to gain time for the arrival of the Prussian Tenth Corps, which was approaching the field. To this end, General BREDOW was ordered to charge the French infantry with his cavalry brigade. One of his regiments having been detached, he had at his disposal only the Seventh Cuirassiers and the Sixteenth Uhlans; and some Prussian infantry in the Tronville copses in front having been mistaken for French, two squadrons were sent against them, thus further diminishing the attacking force to six squadrons. The brigade, thus reduced to half its strength, advanced toward Vionville (see map) in close column of squadrons, the cuirassiers leading. Crossing the road at a point west of Vionville, it changed direction half-left to the low ground north of the village, and deployed to the right; the cuirassiers being on the left with nine platoons in line, and two echeloned to the left rear, the Uhlans on the right with all squadrons in line and echeloned slightly to the rear of the cuirassiers. The deployment executed, the brigade wheeled slightly to the right and advanced at a gallop; four batteries of horse artillery posted west of Vionville concentrating their fire upon the enemy's batteries, and so engaging their attention, that BREDOW arrived near the guns with but slight loss. Only two pieces of the first battery had time to fire before the Prussian horsemen were among the guns, cutting down cannoneers and horses, and completely silencing the battery. Without stopping to make prisoners, the cavalry charged on, struck another battery in rear of the first, and dashed through the supporting infantry squares, riding down two and breaking up several others. Owing to the fury and excitement of the collision, the squadrons had become disordered and out of hand, and they continued the charge, overtaking a retiring mitrailleuse battery, sabering the drivers and horses, and pushing on to the second line of infantry. But just as the troopers were becoming thoroughly exhausted and the horses blown with the fatigues of an attack, in which they had passed over a distance of 3,000 yards, they were struck in counter-charge by French hussars and chasseurs on the right, and cuirassiers on the left. The German horsemen were violently thrown back, and a confused mass of cuirassiers, Uhlans, hussars, chasseurs and dispersed infantry men, thrusting,

cutting, shooting, and yelling, went whirling back through the guns of the batteries, the rallied infantry opening fire whenever friend and foe were sufficiently separated to offer a target, and the French cavalry ruthlessly cutting down their exhausted opponents. When the remnants of BREDOW's command reached the Prussian position, it was found that the casualties, out of a force numbering 800 sabers, were 379 officers and men killed, wounded, and missing. The result of the charge was worth the loss; for the French right was checked, the German reinforcements arrived, and nothing more was seen of the movement which had threatened to sweep BUDDENBROCK's division from the field.

VIII. *When the infantry is exhausted by a prolonged contest with infantry.*

In a determined contest of infantry against infantry, the fatigue of a long advance over broken ground, and the excitement, turmoil, noise, and appalling losses of a fire combat at close range, subject the combatants to such physical fatigue and mental strain at the crisis of the fight, that their exhaustion is often marked by a distinct lull in the battle. If at such a time, the infantry can be charged by cavalry, the latter should have every chance of success; for the nerves of the infantrymen are overstrained, and they are no longer in a condition to use their weapons with effect. If at the battle of Gravelotte, the French cavalry, instead of standing idle behind the left, had been posted on the right near St. Privat, it might have circled out and attacked the Prussian Guards when they were exhausted and shattered by their repulse, and there is every reason to believe that the German attack at that point would then have failed completely.

IX. *When infantry is disordered in retreat.*

The mere fact of infantry being in retreat does not justify cavalry in charging them; for if the retiring force be not demoralized or disintegrated it will probably inflict heavy loss upon the attacking cavalry. It is only when the retreating infantry is thoroughly beaten and demoralized, as at Jena or Waterloo, that the cavalry can charge them successfully and break down their resistance. When the retreating infantry is still intact and in good heart, the cavalry in pursuit should limit its action to threatening demonstrations.

X. In covering a retreat.

Here it may be merely a question of gaining time; and intact infantry may, therefore, be attacked with the deliberate intention of sacrificing the charging cavalry for the purpose of enabling the other troops to escape. The attack, if skillfully made, may under favorable circumstances, result in checking the pursuit altogether. On the day after the battle of Shiloh, FORREST, covering the Confederate retreat with about 350 troopers, observed that a pursuing force, consisting of a regiment of infantry and two battalions of cavalry, was thrown into some confusion in crossing a stream, boldly charged it, and the moral effect of his audacious assumption of the defensive, combined with the losses inflicted, practically stopped the pursuit, though the charge was finally repulsed.

XI. To cut through a surrounding force of hostile infantry.

This use of cavalry is generally a desperate one, and is made as the only alternative to surrender. The chances are in favor of its failure, but there have been instances of its successful employment. At Lovejoy, Ga., (August 20, 1864), KILPATRICK finding his raiding force of 4,800 cavalry (two divisions), surrounded by 12,000 Confederates of all arms, determined to cut his way out. The hostile infantry had formed in three lines, about fifty yards apart, in double rank, and had constructed barricades of fence rails. The first division of the Union cavalry was formed with the leading brigade in line of regiments in column of fours at deploying intervals, the other brigade in column of fours. The second division followed in column of fours. The leading brigade was covered by two troops deployed as skirmishers, who threw down an intervening fence, and appear generally to have performed the functions of ground scouts. The charging columns lost their formation, the men rushing to the front, and (according to a Confederate account) "charging in a solid column, ten or twelve lines deep, running their horses, and yelling like devils." The Confederate cavalry did not wait to receive the charge, but broke in confusion, and KILPATRICK's cavalry dashed over and through the three lines of opposing infantry, capturing a battery of artillery, three flags and 400 prisoners, and rejoining SHERMAN without further serious molestation from the Confederates.

Moral Effect of Threatened Attack.—By merely hovering in the vicinity of the enemy and threatening attack, his infantry may sometimes be temporarily checked and valuable time gained. At Gettysburg (July 1, 1863), HOWARD ordered BUFORD to go to the support

of DOUBLEDAY'S sorely pressed corps. It seemed hopeless to attempt anything against the long lines of hostile infantry, but BURFORD quickly moved out into plain view of the enemy and formed for the charge. The Confederates at once formed squares, which caused them to delay and aided in the withdrawal of the First Corps, probably saving a large portion of it from capture.

A similar result was produced by the Austrian cavalry at Custoza. Two Austrian brigades of cavalry charged shortly after 7, A. M., upon two Italian divisions, consisting of thirty-six battalions, and, though compelled to retire, shook the Italians up so badly that they had to be supported by another brigade. The cavalry then remained in front of these divisions all day, and kept them so thoroughly on the defensive that they were unable to advance to the aid of the rest of the army. In this case, 2,400 cavalry kept 25,000 infantry out of battle all day; but it is to be observed that the best of cavalry was here opposed to a poor quality of infantry.

Formation for Attack.—Infantry in masses or in line in close order should be attacked in line of columns or in successive lines at about 100 yards distance, the lines as nearly equal as practicable, successive waves of cavalry being necessary to prevent the infantry from re-forming when the charge has passed over it. When the infantry is in extended order, it should be charged by foragers, supported by about half of the force in close order; the latter to advance in reinforcement, or form a rallying point in case of repulse.

In charging infantry, cavalry should take the shortest line, but should endeavor, from the first, so to shape its course as to strike the infantry in flank. In attacking the infantry in front, the cavalry should endeavor to approach from the right of the infantry, as the oblique fire of the latter is less effective towards its right than towards its left. It is also an advantage in attacking infantry, to charge up a slight slope, as the bullets are in such a case likely to pass over the heads of the advancing troops. In attacking infantry, it is necessary that the gallop should be taken much sooner than in attacking cavalry, as it is of the utmost importance to diminish the time of exposure to the hostile fire.

In attacking infantry, the cavalry must be careful not to mask the fire of its own infantry and artillery; otherwise the charge might, under some circumstances, be of positive benefit to the enemy. HOHENLOHE mentions the following incident: "An infantry officer who was present told me, with regard to a cavalry charge at Wörth, that at the moment our infantry were falling back down a slope from an attack which had failed, a hail of *chassepôt* and *mitrailleuse*

bullets followed them, and everyone felt that he would never reach the cover of the wood which lay below. Tired to death and resigned to their fate, the whole of the infantry were slowly crawling towards this wood. Suddenly the murderous fire ceased. Everyone stopped, astonished to see what had saved them from the fate which seemed certain to them. Then they saw the French cuirassiers, who, as they pushed forward, masked the fire of their own infantry and artillery. These cuirassiers appeared to them like guardian angels. With the most perfect calm every man halted on the spot where he stood and fired at the cuirassiers, who were soon swept away by the rapid fire.* In this case an ill-advised charge upon repulsed, but not demoralized, infantry played completely into the hands of the enemy.

The Use of Cavalry Against Infantry not a Thing of the Past.—There is no reason to believe that cavalry will not frequently be used against infantry in the wars of the near future. Those critics who would rule cavalry off the battle-field because of the disasters of the French horse in charging intact infantry at Wörth and Sedan, should remember that the same era that saw the Mamelukes annihilated by the French infantry at the Pyramids, and BLÜCHER'S cavalry wrecked against DAVOUT'S squares at Auerstädt, witnessed the decisive charges at Marengo, Austerlitz and Borodino. Granting, as we must, that front attacks of cavalry against good, intact, infantry are out of the question, there are, nevertheless, eleven distinct cases, as enumerated above, in which cavalry can be profitably used against infantry. The employment of cavalry in these cases will certainly often subject it to great loss, but it is everywhere acknowledged that under the conditions of the modern battle-field, infantry must incur enormous losses in attack, and there is no reason why infantry should be expected to face death more cheerfully than cavalry should. Infantry can profit by the shelter of the terrain, and so can cavalry. Infantry does not present so good a target as cavalry; neither does it pass over the ground so rapidly. The physical effect produced by the fire of attacking infantry is lacking in the case of cavalry; but the moral effect of a cavalry charge is greater than that of an infantry attack. Cavalry still has a great future before it on the battle-field; but it must have clear-headed, quick-witted and fearless leaders, and it must be good *cavalry*, not merely brave men on horseback.

CAVALRY AGAINST ARTILLERY.

Of artillery, as of infantry, it may be said, that, if unshaken, well prepared, abundantly supplied with ammunition, and composed

*"Letters on Cavalry." Letter VI.

of good troops, it should not fear a front attack of cavalry. Nevertheless many opportunities will occur in battle in which artillery may be attacked by cavalry with every prospect of success.

I. *When artillery, hurried into action, is unsupported by the other arms.*

It is the tendency of modern tactics to hurry the artillery into action and deploy the army under the protection of its guns. The artillery is habitually massed in huge batteries, the corps and divisional artillery being often united in a line of guns more than a mile in length. If the artillery be audaciously hurried forward without proper escort—as at Sedan, where a great German battery of 200 guns was, for several hours, under the protection of a single regiment of cavalry—an opportunity will be presented for cavalry to move up under the shelter of various features of the terrain, make a sudden dash, and break the line of guns, capturing or damaging the pieces, causing confusion, and giving the enemy an impression of disaster at the very beginning of the fight. Even though a front attack might in this case be necessary, a certain amount of protection could be found in the element of surprise and the difficulty of altering the elevation of the guns to meet the rapidly changing target afforded by the cavalry as it rapidly approaches, now in plain sight, and an instant later concealed by the undulations of the ground.

In the battle of Tobitschau (July 15, 1866), an aide-de-camp looking for a passage across the Blatta Brook, found a dilapidated bridge, and at the same time discovered that an Austrian battery of eighteen guns was without any support. BREDOW (then a lieutenant-colonel) at once led three squadrons across the shaky bridge and advanced upon the battery, two Prussian horse artillery batteries at the same time opening fire on the Austrian guns. The attention of the Austrians being attracted to the Prussian batteries, BREDOW moved straight for the front of the hostile guns, with one squadron in the attacking line, one as a support in echelon on his left, and the third as a reserve to the right rear. The undulating ground afforded considerable shelter until the cavalry was close up to the guns, and a few rounds of grape nervously fired at the last moment produced but little effect upon the charging cavalry, who dashed into the battery, sabered cannoneers and drivers, and captured eighteen guns and 168 men. The cavalry lost only ten men.

A similar attack upon artillery for the purpose of compelling it to abandon its position was made by the French at Mars-la-Tour.

It is thus described by BONIE: "About 4:30 P. M., whilst our troops were engaged in front, one of the enemy's batteries was detached to take us in flank, and with that object took up a position on the road itself, nearly in a line with the Gréyère farm; in order to avoid being turned it was absolutely necessary to silence this fire. * * * Immediately General DU BARAIL passed over the ravine that lay in his front, with the Second Chasseurs d' Afrique, wheeled to the left, and charged the battery in skirmishing order. The enemy had scarcely time to fire, before our men were on them. The Second sabered the gunners as they fled, and still continuing their advance, they came in contact with a superior force of the enemy; they managed, however, to disengage themselves by going off to the right; and rallying in the angle formed by the wood and the road, they opened a sharp fire on the enemy. After this brilliant feat of arms the battery was no more seen."*

II. *When in the course of the battle the infantry supports have been driven back, or have exhausted their ammunition, and the artillery stands alone.*

An opportunity of this kind was open to the French at Mars-la-Tour [Vionville]. It is thus spoken of by VON DER GOLTZ.

"When, in the evening of the battle of Vionville, the dusk descended, and scarcely anything more could be discerned of the infantry on the wide battle-field, and the great masses of the artillery on the center, more than 100 guns strong, stood defenseless, a similar thought, [How if the enemy's cavalry should now appear?] arose in our breasts. It appeared impossible to check a resolute cavalry charge that might have hurled itself upon these batteries. This view of the case was one of the reasons for dispatching all our available cavalry against the enemy."†

III. *When the artillery can be surprised, especially while limbering up or in the act of unlimbering.*

In these cases the artillery is manifestly practically helpless, if not supported by the other arms.

Formation for Attack.—In attacking a battery, the cavalry is divided into two or three parts. The attacking line charges as foragers, divides near the center as it advances, and assaults the battery on each flank, attacking the cannoneers and the battery support. The support advances to secure the battery. The reserve

*"The French Cavalry in 1870" (translated by THOMSON), page 53.

†"The Nation in Arms" (translated by ASHWORTH), page 261.

follows in close order, and is held in hand to repel a counter charge should one be made. If the escort consists of cavalry, the attack on the guns must be made in extended order, but the support must be attacked by a force in close order. If the battery be in position, the cavalry should always endeavor to strike it in flank or rear. Generally a troop or squadron will be sufficient for the attack of a single battery. In any case, the defeat of the support is necessary to complete the capture of the battery. At Brandy Station (June 9, 1863), the Sixth U. S. Cavalry and the Sixth Pennsylvania Cavalry charged upon the Confederate artillery. "Never," says Major McCLELLAN, "rode troopers more gallantly than did those steady regulars, as under a fire of shell and shrapnel, and finally of canister, they dashed up to the very muzzle, then through and beyond our guns, passing between HAMPTON's left and JONES's right. Here they were simultaneously attacked from both flanks, and the survivors driven back.*

Measures to be Taken on Capturing a Battery.—Cavalry may attack a battery, either with the object of capturing it, for the purpose of disabling it, or for the purpose of causing it so much annoyance as to compel it to change its position. The cavalry, once in possession of a battery, should endeavor to carry it off. If this be impossible, the guns should be disabled,† and the horses and limbers carried off if practicable; if this cannot be done, the horses should be killed and the traces cut. When a gun is limbered up and retreating, an attempt should be made to shoot one or more of the horses of the team, preferably the leaders.

DEFENSIVE USE OF SHOCK ACTION.

Shock action, from its very nature, belongs to the offensive; but it may be used in counter-charge as a part of a general defensive plan. The flanks of the infantry and artillery must be protected from surprise by the enemy's cavalry, which should be taken in flank or vigorously assailed in front when it attempts to strike. In such a case, the advantage of position is with the cavalry of the defensive, as the place where it is to be used can be known beforehand, and it can often be stationed in a position affording shelter, concealment, and proximity to the point of action.

* McCLELLAN'S "Campaigns of Stuart's Cavalry," page 268.

† "To disable a field gun, open the breech-block and then break it with a heavy hammer; or load the piece, close the breech without locking it, and fire the piece; or place two or three blank cartridges in the gun, close and lock the breech-block, ram from the muzzle a ball of clay or sod, then unlock the breech-block and fire; or, fire a shotted gun with its muzzle against the chase of another. Guns of the Krupp system may be temporarily disabled by carrying off the breech-block or breaking the handle of the breech-block."—*U. S. Cavalry Drill Regulations*, par. 966.

Divisional cavalry may sometimes be used defensively with effect at the crisis of the fight, to delay the opposing infantry, or even to check it altogether; this being a case of the use of cavalry against exhausted infantry. The best time for a counter charge by the divisional cavalry is, however, at the moment when the enemy has penetrated the position, as the effect of the infantry fire of the defender is then kept up until the last moment, and the counter charge strikes the enemy at the instant of his greatest disorder.

The local defense of cavalry is possible only with fire action.

DISMOUNTED ACTION.

The dismounted fire action of cavalry may be usefully employed for the following purposes:

- I. *To drive away or capture small bodies of infantry or partisan troops, who endeavor to check the progress of raiding or reconnoitering cavalry.*

The difference in self-reliance and power between a cavalry that cannot use effective fire action and one that can, is shown in the following instances where cavalry found its way blocked by irregular troops:

"On the 23d of December, the Eleventh Cavalry Brigade, consisting of a cuirassier, dragoon and Uhlán regiment, was brought to a standstill before the village of Vibray. The dragoon officer in command of the advance guard reporting the village to be occupied by infantry, General VON BARBY decided, as it was getting dark, to bivouac his brigade for the night before the place. The next morning, my squadron relieved the dragoons and took the advance guard of the brigade, I being ordered to command the advance guard of the squadron. The orders I received were: 'Vibray is still occupied; if you are fired upon, send one man back to report, leave two to watch the road we are advancing on, and gallop through the town with the remainder.' We were fired on, and I galloped through the town, receiving a parting volley, fired from their horses, by a dozen Chasseurs d'Afrique, who then made off in the opposite direction. Here is an instance of a whole cavalry brigade stopped by twelve mounted riflemen."*

"At the little town of Corydon, Colonel MORGAN's advance guard found a body of militia posted behind rail barricades. He charged them, but they resolutely defended their rail piles, killing and wounding several men. * * * A demonstration was made upon the flank of the enemy by one regiment of the second brigade, and Colonel MORGAN again advanced upon their front, when, not under-

*Captain LUMLEY, late Thirteenth Prussian Uhlans, in *Journal of the Royal United Service Institution*.

standing such a fashion of fighting upon two or three sides at once, the militia broke and ran, with great rapidity, into the town, their progress accelerated (as they got fairly into the streets) by a shot dropped among them from one of the pieces."*

II. *To force a defile which blocks an advance, and thus avoid a delay.*

On the retreat from Gettysburg, STUART, finding the pass of the Catocin Mountains, near Cooperstown, Md., occupied by United States troops, dismounted a large portion of his command, and, fighting from crag to crag, finally forced the passage.

III. *To seize and hold localities until the arrival of infantry.*

At Gettysburg (July 1, 1863), BUFORD, discovering the approach of the enemy, and realizing the value of the position, dismounted his cavalry, and stubbornly held his ground against heavy bodies of Confederate infantry until the arrival of the First Corps.

IV. *To reinforce infantry in emergencies.*

The incomparable BUFORD illustrated this use of cavalry also at Gettysburg. In his official report, he says: "After the fall of General REYNOLDS, whose advance troops partially drove back the enemy and made heavy captures of prisoners, the enemy brought up fresh troops, and engaged General DOUBLEDAY's command, which fought bravely, but was greatly outnumbered and forced to fall back. Seeing our troops retiring, and their need of assistance, I immediately rushed GAMBLE's brigade to DOUBLEDAY's left, and dismounted it in time to render great assistance to our infantry, and to check and break the enemy's line. My troops at this place had partial shelter behind a low stone fence, and were in short carbine range. Their fire was perfectly terrific, causing the enemy to break and rally on their second line, which made no further advance toward my position."

V. *To fill a gap in the line of battle.*

At Wagram (July 6, 1809), NAPOLEON finding that the Austrians were making dangerous progress on his left, withdrew MASSENA's corps from the center of his line, and moved it to the left, filling with cavalry the gap thus formed until he could occupy it with artillery. Such a use of cavalry would now be vastly more practicable, the cavalry dismounting and taking the place of the infantry in

* DUKE'S "History of Morgan's Cavalry," page 435.

every sense of the word. Indeed, had the present conditions then existed, the cavalry would probably have been moved to the left, and MASSENA would not have been withdrawn.

Similarly, cavalry may occupy a position for the purpose of relieving infantry, and causing the enemy to believe that the position is still held in force.

VI. *In an inclosed, wooded, or broken country, where mounted action is impracticable.*

Innumerable instances of this use of cavalry because of the impracticability of using it mounted might be cited from the history of the War of Secession. The most striking, perhaps, was the use of WILSON's entire cavalry corps dismounted at the battle of Nashville (December 15-16, 1864).

VII. *In covering a retreat.*

Describing the pursuit of Hood's army after Nashville, General WILSON says: "HATCH's column had not gone more than two miles when its advance, under Colonel SPALDING, encountered CHALMERS' cavalry strongly posted across the road behind a fence-rail barricade. They charged it at once, and a spirited hand-to-hand *mêlée* ensued, in which many men were killed and wounded on each side. * * * The gallant Confederates were driven in turn from every fresh position taken up by them, and the running fight was kept up till nearly midnight. CHALMERS had, however, done the work cut out for him gallantly and well. He was overborne and driven back, it is true, but the delay which he forced upon the Federal cavalry by the stand he had made was sufficient to enable the fleeing Confederate infantry to sweep by the danger point that night, to improvise a rear guard, and to make good their retreat the next day."*

VIII. *When exhausted or defeated cavalry is called upon to resist a charge of fresh cavalry.*

At Upperville, Va. (June 21, 1863), GAMBLE's cavalry brigade, having been repulsed in a charge upon superior numbers of Confederate cavalry, retired a short distance, quickly dismounted, took a position behind a stone wall, and repulsed with its carbine fire several charges of the opposing cavalry.

IX. *In conjunction with cavalry mounted.*

At Aldie (June 17, 1863), Colonel MUNFORD, commanding a brigade of Confederate cavalry, posted a force of dismounted caval-

* "Battles and Leaders of the Civil War," Vol. IV., page 469.

rymen behind a stone wall perpendicular to the front of the mounted troops. The United States cavalry, charging upon the mounted Confederates, received a heavy fire from the dismounted men, and being driven back by a counter charge, were again subjected to a biting fire in their retreat.

At Okolona (February 22, 1864), FORREST, holding his antagonist in front with a dismounted force, made a decisive mounted charge against his right flank.

X. *Whenever cavalry, through force of circumstances, is deprived of the power of using mounted action.*

When the cavalry of BAZAINE's army, shut up in Metz, had lost its horses from starvation, the dismounted men were armed with chassepôts, and drilled to work as infantry. With cavalry armed and trained as most of the cavalry of the present day is, any catastrophe causing the loss of the horses could be promptly met by making use of the cavalry dismounted, without any additional drill.

Increased Value of Dismounted Action.—The increased value of dismounted fire action is due solely to the increased range of firearms. With the old muzzle-loading, smooth-bore, weapons it would have been almost impossible for cavalry to do any effective work on foot, and then mount and withdraw. Dismounted fire action was accordingly limited to a very few objects, such as forcing a passage or defile against inferior numbers of foot troops, or in defending some similar position to the last extremity. Cavalry can now, however, dismount and subject the enemy to a destructive fire from a range of 1,000 yards to that of 200 yards, and still have time, if pressed by superior numbers, to mount and withdraw in safety.

Formation.—To prepare for dismounted action, the cavalry is always formed in column of fours or in line of columns of fours, usually one man of each four holding the horses, and the rest of the command forming for action to the right, left, right-front or left-front of the column. A mounted reserve is retained for such mounted action as circumstances may require. It may be charged with the protection of the led horses, or the latter may be intrusted to a designated detachment or detachments.

The proportion of men dismounted is generally three-fourths of the whole command, excepting the mounted reserve, but depends upon the degree of danger to which the horses are exposed, and the amount of mobility required of them, as well as the amount of fire action required of the dismounted line. It may be necessary to keep as many as half of the men mounted; and on the other

hand, when a strong firing line is imperatively necessary or the horses are well sheltered and likely to remain stationary, seven-eighths of the force (excepting the mounted reserve) may be put in the firing line, each horse holder being intrusted with the horses of an entire squad. The horse holders usually remain mounted; but when charged with the care of many horses, or in order to obtain shelter, they may be allowed to dismount. The horses should never be exposed to direct fire if it can possibly be avoided; but they should be kept as near the line as considerations of protection permit, and they should not be moved unless a material change is made in the position of the dismounted men. The horses should be kept under cover in rear of their respective subdivisions, and it is very important that they should be brought up to the line (or remain standing) in the same formation that they were in when the troopers dismounted; otherwise there will be confusion and delay at a time when haste is urgent.

The dismounted men are maneuvered and fought in essentially the same manner as infantry, the fighting line consisting of skirmishers, support and reserve. The latter is in addition to the mounted reserve. When the squadron is in action as a part of the regiment, there is no mounted squadron reserve, except such mounted guard as may be necessary for the led horses.

Offensive Action.—As a rule, the cavalry approaches as near as possible to the enemy before dismounting. It should at least be able to remain mounted until it encounters artillery fire. The attack on foot is conducted according to the principles already prescribed for infantry; but the dismounted force should put as many carbines as practicable in the firing line from the first, and should close with the enemy as quickly as possible. When the hostile position is carried, the dismounted men should at first merely hold it, the mounted reserve pursuing, and the led horses being brought up to the position. The attacking force is then assembled as soon as possible, and may either mount and follow the mounted reserve in pursuit, or prepare to defend the position from counter attack. Whenever a sufficient number of mounted men can be spared, an attempt may be made, in conjunction with the dismounted attack, by the mounted reserve against the enemy's flank or rear.

Even when the attack is to be made on foot, ground scouts and combat patrols (mounted if practicable) should always be sent out, for the change from dismounted to mounted action is one for which the cavalry should always be prepared. The ground scouts should be drawn in when the fight begins, the patrols remaining on the flanks.

Defensive Action.—When dismounted cavalry is acting on the defensive, the whole of the reserve should, as soon as the enemy's attack is developed, be put in the firing line, unless there be danger to the position at other points. If attacked by a superior force, the defenders should discontinue the action in time to mount and retire to another position, unless ordered to hold on at all hazards. In defending a bridge, street, or defile, the dismounted cavalry should construct barricades, and, as a general rule, cavalry should intrench whenever it is on a pure defensive.

If opposed to mounted cavalry (as in the eighth case mentioned above), the cavalry on the defensive should endeavor to subject it to an annihilating magazine fire at short range, a reserve being kept mounted. If the assailants are thrown into confusion by the fire, or if they attempt to dismount, an opportunity may be offered to the reserve to charge them, or to attack their led horses.

As a rule, cavalry should avoid engaging in a dismounted fight with infantry; but should an emergency demand such action, it should endeavor to make up for its inferior shooting power by its superior mobility. Cavalry may often, by celerity of movement and skill in utilizing concealing features of the terrain, be able to strike the flank of a marching column of infantry, which it can annoy and throw into disorder with its fire, gradually withdrawing from the firing line as the infantry becomes engaged, and mounting and retreating before it can receive heavy loss in return.

Dismounted fire action adds immeasurably to the independence and fighting power of cavalry, and is an indispensable part of the functions of that arm; but, great as its importance is, it is only the complement of mounted action, and must never be regarded as the chief use of cavalry.

MOUNTED FIRE ACTION.

Mounted fire action with the carbine is here considered. The pistol may be used in shock action in place of the saber.

Mounted fire action may be used as follows:

- I. *As a means of temporary resistance by small scouting parties, or by the point and flankers of an advance guard.*
- II. *In the pursuit of a beaten enemy, when a mounted charge is impracticable.*
- III. *In covering a retreat when the pursuit is so active and so strong as to make it unsafe to dismount and inexpedient to charge.**

*See the subject "Mounted Fire Action," in the chapter on "The Characteristics of the Three Arms."

IV. *When the opposing cavalry is charging over heavy and unfavorable ground.**

Mounted fire action may be used by cavalry in close order, but the habitual formation for this mode of fighting is in extended order, the skirmishers being deployed with intervals of four yards.

Mounted fire action is the least effective use of cavalry, and it may be well to repeat that it should never be used when either shock action or dismounted fire action is practicable.

THE EFFECT OF SMOKELESS POWDER ON CAVALRY TACTICS.

The absence of smoke on the field of battle will deprive cavalry of one of its best means of surprise; and it will be more difficult than heretofore to bring the squadrons unshattered up to a point from which their charge can be launched with effect. A field with a suitable combination of concealing features and good charging ground is, consequently, more necessary than ever. Reconnaissance will be more difficult than formerly, as the scouts will be plainly visible, while the difficulty of obtaining shelter from the fire of an unseen enemy will be great. Under the increased danger, the scouts will probably often shirk their duty, and the engagement may thus begin without the position of the enemy being well known. The duties of ground scouts will be more difficult and dangerous than ever.

There is, however, one compensating advantage—a great one—for the cavalry, in the fact that the absence of smoke will make it possible to form a more correct estimate of the condition of the enemy than was possible under the old conditions. Shaken and demoralized infantry will no longer be concealed by a friendly mantle of smoke, and if the cavalry be within striking distance, it will be an easy matter to seize the opportune moment for a charge.

CAVALRY RAIDS.

The subject of raids belongs really to the strategic service of cavalry; but this duty is so important and so intimately connected with the various tactical uses of cavalry that it may well be considered in connection with tactics.

Cavalry raids are undertaken for one or more of the following objects:

* See the description of the use of mounted fire action by the 20th Chasseurs à Cheval at Eylau in the next preceding chapter.

- I. *To threaten or destroy the communications of the enemy, thus compelling him to weaken himself for their protection, or delay his advance.*

The operations of MORGAN and FORREST against the communications of the Army of the Cumberland after the battle of Murfreesboro, and FORREST's threatening movements toward SHERMAN's communications in 1864, exemplify this use of cavalry raids.*

- II. *To check an invading army by operations against its communications and the capture of its immediate base of supplies.*

In December, 1862, GRANT, operating against Vicksburg from the north, was in the vicinity of Oxford, Miss. His base of supplies was at Columbus, Ky., his immediate base being at Holly Springs, Miss. FORREST left Columbia, Tenn., on December 11th, and, in a three weeks' raid, wrecked sixty miles of the railroad between Jackson, Tenn., and Columbus, cutting off GRANT's communications with Columbus and Washington for twelve days, and completely interrupting the transportation of supplies for a much longer period. At the same time, VAN DORN, with the entire cavalry force of his army, 3,500 men, moved from Grenada, around GRANT's left, and captured Holly Springs, with its garrison of 1,500 men, where he destroyed an enormous quantity of stores, valued at \$1,500,000, and retreated in safety to Grenada.

These combined operations of FORREST and VAN DORN constitute, perhaps, the most successful and profitable raid ever undertaken. The region in which the armies were operating was exhausted, and the destruction of the depot and the railroad by which further supplies could be accumulated, compelled GRANT to abandon his movement against Vicksburg and fall back upon Memphis.

In a similar manner, raids may be made for the object of compelling the enemy to abandon a position by cutting the railroads on which he depends for supplies. The raids of STONEMAN, MCCOOK, and KILPATRICK, in the Atlanta campaign, were for this purpose, but were unsuccessful.

- III. *To make a diversion in favor of the main army by drawing off troops in pursuit of the raiding force.*

After the battle of Antietam (September 17, 1862), LEE's army, diminished in numbers and suffering from its disastrous check, had crossed into Virginia, and it was of great importance that it should have time for recuperation before again confronting the Army of the

* See the next preceding chapter for a sketch of these operations.

Potomac. STUART, with a select force of 1,800 cavalry, recrossed the Potomac, and in a raid of three days, passed completely around McCLELLAN's army, captured Chambersburg, destroyed a vast quantity of public property, seized 1,200 horses, and captured 280 prisoners.

"Not the least important of the results of this expedition," says STUART's biographer, "was its effect on the physical and moral condition of the Federal cavalry. As to its physical results, General McCLELLAN sufficiently describes them when he says in his report, that it was necessary for him to use all of his cavalry against STUART, and that 'this exhausting service completely broke down nearly all of our cavalry horses and rendered a remount absolutely indispensable before we could advance on the enemy.' On the 6th of October, General McCLELLAN had received positive orders 'to cross the river and attack the enemy.' He was unable to execute these orders until the last days of that month. His correspondence with General HALLECK shows that the condition of his cavalry was one of the chief causes of this delay."*

IV. *To gain information.*

In June, 1862, McCLELLAN's army was on the Chickahominy awaiting reinforcements. LEE, contemplating an offensive movement, sent STUART "to make a scout movement to the rear of the enemy," the object being mainly "to gain intelligence of his operations, communications, etc.,"† with incidental instructions to capture trains, destroy supplies, etc. Beginning his raid on the 12th of June, STUART reported to General LEE on the 16th, having made a circuit around McCLELLAN, in the course of which he captured a few prisoners and destroyed a considerable quantity of United States property.

"The greatest results, however, were those which followed from the information obtained by STUART. All doubt as to the location of the Federal army was solved, and the possibility was demonstrated of those movements which, on the 27th of June, culminated in the defeat of the Federal right wing at Cold Harbor."‡

V. *To cause alarm in the enemy's country, and thus destroy confidence in the enemy's commanding general, or create a sentiment unfavorable to the prosecution of the war.*

The greatest result of STUART's Chickahominy raid was, however, a moral one. It caused a great commotion and excitement through-

*"Campaigns of Stuart's Cavalry."

†Official instructions of LEE to STUART.

‡"Campaigns of Stuart's Cavalry."

out the Army of the Potomac, and shook the confidence of the North in McCLELLAN.*

The raid of MORGAN into the Northern States, in the summer of 1863, was undertaken with a view (among other objects) to bringing home to the people of the North "something of the agony and terror of invasion," and in connection with LEE's invasion of Pennsylvania, to give such an impression of Confederate success as to strengthen the opposition of a faction in the North to continuing the war. In this object it failed signally; for though great excitement and alarm were caused among the inhabitants of Indiana and Ohio, no assistance was received from the anti-war element in those States, and MORGAN's entire command was dispersed or captured. His raid had, however, the effect of keeping employed for a number of weeks a force of United States troops many times larger than his own command, and thus deprived ROSECRANS of reinforcements that would have sufficed to turn Chickamauga into a Union victory.

VI. *To interfere with the mobilization and concentration of the enemy's forces at the beginning of a campaign.*

Raids for this purpose should be made by small forces, as their object will generally be the destruction of a bridge, viaduct, tunnel or lock, and celerity will be of paramount importance, in order that the raiding force may escape the large bodies of troops concentrating in the theater. This kind of raids may often be made by mere expeditionary patrols.†

VII. *To devastate the enemy's country and destroy his resources.*

The best illustration of such an operation is the great raid of WILSON in the spring of 1865.‡ A raiding force employed for this purpose should be large—in fact, an army of cavalry able to fight a battle, and resembling an ordinary raiding column only in its independence of a base or dépôts of supply.

VIII. *To effect the release of prisoners.*

In February, 1864, KILPATRICK moved against Richmond with a raiding force, consisting of 4,000 cavalry and a battery of artillery, for the purpose of making a dash upon the Confederate capital and releasing the Union prisoners confined there. He reached the outskirts of Richmond, but was unable to effect his object. One of the

*See "The Civil War in America," by the COMTE DE PARIS (American edition), Vol. II., page 83.

†See "The Service of Security and Information," page 126 *et seq.*

‡See the next preceding chapter.

objects of STONEMAN's unsuccessful raids in Georgia, in 1864, was the release of Union prisoners confined at Macon and Andersonville.

When raids are undertaken for this purpose, it is necessary to avoid embarrassing the raiding column with a mass of unarmed prisoners on foot. The raid will be unsuccessful unless the prisoners can be quickly conducted to some point of safety near at hand, or can be provided with arms, and thus form a reinforcement sufficient to enable the raiding force to repulse any attack that is likely to be made upon it.

When Raids are Practicable.—Raids are rarely practicable in the enemy's country. In the War of Secession the only raids on Northern soil were STUART's Chambersburg raid, which was of only three days' duration, and MORGAN's great raid, which resulted in his own defeat and capture. It being necessary to obtain information in order to elude the hostile forces pursuing or endeavoring to head the raiding column, it follows that in a hostile country a raiding force is operating in the dark while its adversaries have every advantage. In Tennessee and Kentucky, MORGAN was always well informed of every movement of the United States forces; but after he crossed the Ohio River he found it "utterly impossible, moving as rapidly as he was forced to do, and in the midst of a strange and hostile population, to get positive information regarding any matter."*

The raiding columns of United States cavalry in the South met with an advantage not often found in an enemy's country; for while the white population was intensely hostile, the slaves were, as a rule, more than willing to give information, and act as guides or spies. This limitation of raids to a friendly country is all the more certain when the belligerent nations speak different languages. Raids of French cavalry against the communications of a German army invading France should be perfectly feasible; but if the French were invading Germany, they would doubtless find raiding exceedingly difficult. The objection of some European authorities† to making raids in a thickly populated region may be dismissed at once with the remark that cavalry that cannot overcome the resistance of home guards, *franc-tireurs*, or armed peasants, is not fit for raiding, however valuable it may be on the field of battle.

The allurements of adventure offered by a raid furnish a temptation to every true cavalry leader, but it is a temptation that should be resisted unless the object justifies the raid; for aside from the peril of capture (which may be evaded by courage and skill) there

* DUKE.

† Notably VON DER GOLTZ and HOHENLOHE.

exists the danger of the demoralization of the command by a spirit of depredation, or of its being for some time rendered unserviceable by the fatigues and exhaustion of raiding duty. Above all, is the risk of being absent from the army when a decisive battle occurs. Many of the raids in the War of Secession, being undertaken without an adequate object, or not conducted with skill, terminated in disaster.

In STUART's Chambersburg raid, his entire command marched eighty miles in twenty-seven hours. In MORGAN's great raid, his command averaged for some days twenty-one hours a day in the saddle, and on one occasion marched ninety miles in thirty-five hours. "The men in our ranks," says General DUKE, "were worn down and demoralized with the tremendous fatigue, which no man can realize or form the faintest conception of until he has experienced it. It is as different from the fatigue of an ordinary long march, followed by some rest, as the pain given by an hour's deprivation of water is unlike the burning, rabid thirst of fever." In General WILSON's raid against the railroad junction at Burkesville, Va., in June, 1864, with his own and KAUTZ's cavalry divisions, the command marched over 300 miles and destroyed sixty miles of railroad in ten days. General KAUTZ says that for nine days and nights his men were in the saddle, or destroying railroads, and were so tired that every exertion of the officers was necessary to keep them awake even under the enemy's fire. Many were captured asleep on the road.*

The object must be an important one to justify such demoralizing fatigue and the consequent necessary rest for recuperation. VAN DORN's raid upon Holly Springs had an object worth any sacrifice; for it decided a campaign, and a great battle could have done no more. Even if his success had been gained with the loss of every trooper in his command, the raid would have been worth its cost. On the other hand, STUART's third raid around the Army of the Potomac, though successfully effected, was a positive misfortune to the Confederates; for it caused his absence from LEE's army on the first day of the battle of Gettysburg, when his cavalry would have been of incalculable value. In a similar manner, an ill-timed raid of FORREST, in compliance with Hood's orders, "to drain the country of persons liable to military service, animals suitable for army purposes, and subsistence supplies," caused his absence from the battle of Nashville, and doubtless contributed materially to the defeat of the Confederate army.

Composition and Preparation of a Raiding Force.—A raiding force

* Official Report, July 4, 1864.

should be composed of well-mounted, well-disciplined, self-reliant, troops, sufficiently toughened by service to be able to endure the greatest hardships. It should consist of complete organizations, instead of detachments from different ones, and should usually vary in numbers from 1,000 to 3,000 men. When quick work, requiring absolute secrecy, is the object, the force employed may be very small; when, on the other hand, the expedition is for the purpose of devastating a region and destroying the enemy's resources, the force must be large.* As the force should be strong enough to brush away the hostile bodies met in its path, and small enough for mobility, the resistance likely to be encountered should be carefully considered, and the strength of the raiding column regulated accordingly.

As a rule, no infantry should form a part of a raiding column. If a deficiency in cavalry render the employment of infantry necessary, the latter should be transported in wagons or mounted on impressed animals. A few guns may often be used with great advantage on a raid, but they should consist of horse or mountain artillery, and should not, as a rule, exceed two guns to 1,000 cavalry.

A raiding force should always count upon living upon the country; but, to meet emergencies, a reserve of supplies for a few days should invariably be carried along. The commander of the raiding force should compute as accurately as possible the number of days for which he should be compelled to provide his command with supplies in the event of the enemy's resistance, or other emergency, preventing him from foraging, and should carry half rations and half forage for such number of days. These supplies should be carried by a train of pack mules; for a wagon train with a raiding column may be characterized as an unmitigated nuisance. A single pack mule will carry one day's half rations for 160 men, and one day's half forage (grain) for thirty-five horses. Each trooper might be required to carry as much as five days' full rations on his own horse, and he should invariably be required to carry 200 rounds of carbine ammunition and an extra pair of horse shoes. Pioneer tools and explosives, for use in the destruction of railroads, bridges, tunnels, etc., should be provided and carried in the pack train.

The objective of the raid should be definitely determined, and the commander should know beforehand just how he is to attain it. It is always well to have an alternative objective, so that in case it

*MORGAN'S first raid into Kentucky was made with 900 men; his great raid with 2,400. STUART'S raiding columns varied in strength from 1,500 to 2,000 men; his great Chambersburg raid being made with 1,800. GRIERSON'S raiding column numbered 1,800 men. WILSON'S command, including KAUTZ'S, in the Burkesville raid consisted of a force of 5,500. WILSON made his great raid through Alabama and Georgia with 13,000 men; and SHERIDAN had 10,000 troopers under his command in his raid against the James River Canal.

should be impossible to attain the principal object, the accomplishment of the second will prevent the raid from being altogether fruitless, and will even give it the appearance of success—a matter of no small importance in its effect upon the enemy and upon the morale of the raiding troops. Everything possible should be done to obtain a clear knowledge of the region through which the raid is to be made, and to gain information while in it. It was the custom of MORGAN to send scouts and spies into the region in which he intended to operate, where they remained, familiarizing themselves with everything pertaining to its roads, bridges, resources, and the location of hostile troops, until the raiding column arrived, when they were at once ready to act as guides. For manifest reasons, this plan would not work well in a hostile country, where it would probably be necessary to impress guides at all hazards.*

Conduct of the Raid.—But little can be prescribed for the conduct of a raid, as each expedition will present its own peculiar circumstances to which the operations must conform. Except in the case of a very large raiding force, it is generally advisable to march in a single column, in order that the force may be kept well in hand; for in moving with the rapidity required in raids, the junction of parallel columns in critical emergencies could not be counted upon with any degree of confidence. The main command should be in constant readiness for action. Individual scouts and small patrols should be kept well out to the front and flanks, and small parties (not exceeding in the aggregate more than one-third of the command) should be sent out to forage and seize horses, to replace those which may become exhausted and broken down. Receipts should be given for all forage, provisions and horses taken, in order that the people may present to their own government claims for remuneration; and no family should be left in want. A tendency to plunder is likely to spring up in a raiding column, even if composed of the best of troops; † and it should be promptly and sternly repressed not only from motives of humanity, but to prevent the demoralization of the command.

If circumstances render a detachment necessary for any purpose, its commander should be clearly instructed not only in regard to

* For the manner of selecting and using guides in a hostile region, see "The Service of Security and Information," page 110, *et seq.*

† General KAUTZ, in his official report of his raid of May 5 to 17, 1864, says: "The fighting qualities of the men I have never seen excelled, and in this respect I can congratulate the whole command without distinction. I have, however, to deplore a disposition to pillage and plunder on the part of some of the men, and a want of proper officering on the part of some of the officers to check this tendency."

the object he is to accomplish, but also what he should do in case it becomes impossible to rejoin the main column. Detachments should not be made without some important object; for the commander must always regard as very possible the definite separation of the detachment from his command.

For the leader of a raiding force, secrecy, celerity and resolution should be the motto; for his command, discipline and endurance are the two essential qualities.

DESTRUCTION OF COMMUNICATIONS.

The principal destructive efforts of a raiding force will be directed against railroads, bridges, tunnels, locks and ordinary roads.

Bridges.—To destroy a bridge, a charge of gun-cotton should be exploded in the haunches of an arch, or if time does not admit of this, in the crown of the arch. Iron girder bridges can be most easily destroyed by placing the charges under the supports.

Railroads.—The following manner of destroying a railroad is based on the method employed in the War of Secession. The men are divided into sections, several hundred men in each. The first section is distributed along the track, one man at each tie, and at a given signal, the entire piece of track thus manned is raised to a vertical position. At a second signal, the track is thrown over so that the rails are underneath and the ties on top. Each man next loosens his tie from the rail, and the section moves on to another portion of the track. The second section now takes its place at the portion already torn up, collects the ties in piles of about thirty each, and places the rails on the top of the piles, the center of the rail over the center of the pile. Fire is then set to the piles, and the second section follows the first. The third section now comes up, takes the place of the second, and when the rails are sufficiently heated, removes them, two men to each rail, with "railroad hooks" or pinchers, and bends them around trees or posts, at the same time twisting them. The third section now follows the second, which, continuing the work of the first, has by this time another lot of rails ready, and the work is thus carried on to completion. When the road is well ballasted, preliminary work with pick and shovel will, of course, be necessary.

The rolling stock should be burned, blown up, or run at full speed to a broken bridge and precipitated into the river. When haste is urgent, rails may be broken, here and there, by exploding gun-cotton against them, or by removing the outside rail on a curve.

This would, however, be only a temporary impairment of the road, worthy of an expeditionary patrol, but not of a raiding column.

Tunnels.—An effectual way of blocking a railroad—at least temporarily—is by blowing in a tunnel. The tunnel should be blown in at several places simultaneously, or beginning at the center and blasting at different points to the end.

Telegraph.—A line of telegraph may be destroyed by cutting down the poles, cutting the wires, and breaking the insulators. It may be temporarily disabled by winding together the wires (first scraped clean) with fine wires.

Locks.—The gates of a lock can easily be destroyed with gun-cotton. If time permits, the lock can be more permanently damaged by blowing in the walls at the sides.

Ordinary Roads.—Ordinary roads can be blocked by felling trees across them, or by blowing up the roadbed.*

RÉSUMÉ.

The tactics of cavalry is more varied than that of any other arm. It embraces shock action in line and in column; fire action mounted and on foot; a combination of fire and shock action either mounted or dismounted; and the simultaneous use of fire action dismounted and shock action mounted by different parts of the same command. The arms, training, and tactical formations of modern cavalry adapt it to use on varied ground, and in every phase of the battle, and sustain General KILPATRICK's apothegm, that "cavalry can fight anywhere except at sea."

* For detailed instructions in regard to hasty demolitions, etc., see the "Manual of Field Engineering," prepared at the U. S. Infantry and Cavalry School.

NOTES ON THE MECHANICAL PRINCIPLE OF THE BIT.

BY FIRST LIEUTENANT E. E. GAYLE, SECOND ARTILLERY.

CHAPTER IV., Part II., of Major DWYER's "Seats and Saddles, Bits and Biting," is devoted to the bit and its appurtenances; the first part of the chapter to a discussion of the mechanical principle involved, namely, that of the lever, from which conclusions are drawn that seem to be generally accepted as authoritative and final. That these conclusions are correct is attested by the universal favor with which the bit, resulting from them, is received; but that they are the logical sequence of the discussion is highly improbable, for the reason that the argument contains many statements wholly erroneous; it seems that the conclusions must first have been assumed and afterwards an attempt made to devise an argument to fit them. The following notes are made with a view to correcting some of these statements, and to affording a closer insight into the application of the mechanical principle involved. Below are quotations from the chapter, for purposes of ready reference:

"Applying this (the principles of a lever of the first order) to a bit, the bars of which represent a lever, * * the power is applied to the lower ring to which the rein is attached, * * the fulcrum or prop must be represented by the bars of the horse's mouth on which the mouth-piece acts, and the pressure of the curb on the chin would represent the weight to be raised. But it has been shown that in levers of the first order, the power and weight move in *opposite* directions in their rotation about the prop; in this case, therefore, the horse's chin, in consequence of the pressure exercised by the curb, should move forward. Now, in fact, there is no *weight to be raised* in the purely mechanical sense of the expression—it is the question of the infliction of a certain amount of pain from which the horse shrinks; and if the curb act *more painfully* than the mouth-piece, in consequence of its construction or position, we obtain the action of a lever of the first order, which we should never desire.

"A lever of the second order is what we want for biting; the weight in this case is represented by the pressure on the bars of the

mouth, the curb acting merely as a fulcrum, the horse's head follows immediately the pressure on the bars of the mouth in the direction of the rider's hand. It is, however, quite possible to spare our horses the infliction of torture merely by adjusting our bits altogether on the principle of a lever of the second order—that is to say, by converting the curb into a simple prop or fulcrum for the lever action on the bars of the mouth, which may be effected by rendering it (the curb) perfectly painless, so that then the small amount of pressure exercised on the bars, acting in the proper direction, and not being counteracted elsewhere, is the sum total of pain it becomes necessary to inflict, and even this may be reduced to a minimum."

To say that we will adopt a particular order of lever and arrange the bit to fit it, as it were, is absurd; the principle upon which the bit acts is fixed, it is the same now as it has always been; lengthening or shortening the arms to produce greater or less pain; increasing or diminishing pressure on the bars or chin-groove do not affect it in the remotest degree; as it exists and is a lever, the question is to determine to which order of lever it does belong, impose our conditions, deduce our results, and from them determine the proper relation of its different parts.

The following figures 1 and 2 represent levers of the first and second orders respectively:



In their analogy to the bit P would represent the power applied to the reins, W , in Fig. 1, the resistance offered by the curb, and in Fig. 2 the pressure on the bars of the mouth. It is a well known principle of the lever that the power is to the resistance, a weight, inversely as their respective lever arms; if the levers are five inches long and the forces are applied at points indicated we would have, with a pull of five pounds at P , from the proportion $P:W::WF:PF$, W , in Fig. 1, equal to seven and one-half pounds, and in Fig. 2 to twelve and one-half pounds; in other words it would cause a pressure of seven and one-half pounds on the chin-groove, and twelve and one-half pounds on the bars of the mouth. This is under the supposition that the forces at P and W are applied in a direction perpendicular to the axis of the lever.

The statement quoted above that if the curb act more painfully than the mouth-piece, in consequence of its construction or position, we obtain the action of a lever of the first order, is wholly erroneous; neither the construction of the curb nor its position, in the sense above used, has the slightest connection with the order to which the

lever belongs. It would be just as reasonable to say if the curb act more painfully than the mouth-piece, in consequence of its having spikes on its surface or being attached to the horse's throat, we obtain the action of a lever of the first order. This savors very much of the logic in the famous argument of Mr. REPPENHAGEN anent the hanging of the anarchists and the United States government. It is then stated that "what we need for biting is a lever of the second order, and that our horses may be spared the infliction of torture merely by adjusting our bits on its principles,—that is to say, by converting the curb into a simple prop or fulcrum for the lever action on the bars of the mouth." In short, the abstract idea of selecting a lever of the second order to represent the bit, has rendered the curb painless—has removed from it all harmful pressure. This is the idea conveyed for no mention is yet made as to the form of the curb itself, only as to its position.

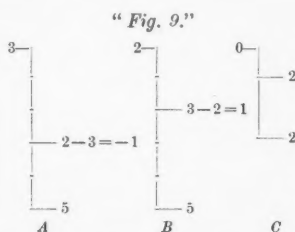
Following these statements three diagrams are given in Fig. 9, here reproduced, to demonstrate the truth of these conclusions:

It is stated that "if a power equal to 5 be applied to the reins, 3 parts will act on the curb, and 2 on the mouth; this is shown at A." Let us see how the principle of the lever supports this statement. As this is a lever of the second order, the lever arm of the power 5 applied at the reins is the entire length of

the bit, say 5 inches; the lever arm of the weight, represented by the intermediate arrow, is 3 inches; hence, we have the proportion $5:2::3":5"$ or $6=25$. The same state of affairs obtains at B. The next diagram is beyond our comprehension; just what amount of force it is necessary to remove from the curb to reduce its painful action to zero could not readily be determined short of an interview with the horse who, with his proverbial sense, would probably suggest that it should all be removed; this would necessitate no pull on the reins and we would be, so to speak, at a stand-still.

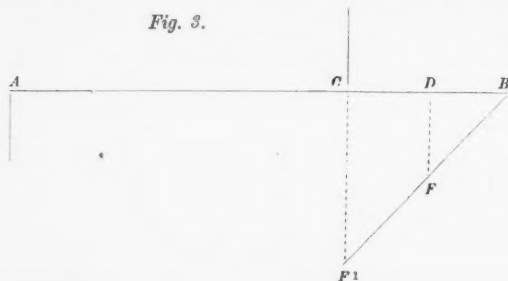
Apart from the incorrect statements and demonstration above referred to, the essential characteristic of the lever seems to have been wholly ignored. A lever is defined to be a simple machine, consisting of a bar or *rigid* piece of any shape, acted upon at different points by two forces which severally tend to rotate it in opposite directions about a fixed axis called the fulcrum.

To illustrate more in detail, let A B, Fig. 3, represent the axis of the



bit, A the point of attachment of the reins, B that of the curb-strap, BF^1 the position of the strap, and C the mouth-piece. If ABF^1 were perfectly rigid we could assume any point as C , B , F or F^1 as the fulcrum; with the power at A , applied as indicated, and C as the

Fig. 3.

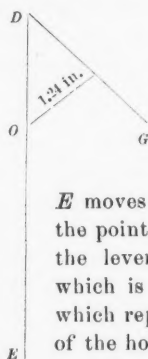


fulcrum, AC would be the lever arm; with F as the fulcrum the lever arm would be the perpendicular distance from F to the line of direction of the force A , but the lever would be shortened by the distance, DB . If F^1 be the fulcrum, the line of direction of the force C would pass through the fulcrum, and we would have no lever at all. This rigidity does not, however, obtain with the bit and curb-strap considered together, and, therefore, we cannot assume the fulcrum to be at any point of the latter. It will thus be seen that the bit cannot be other than a lever of the first order, and it will be so regarded in the discussion below.

Reading farther along in the chapter we find many common sense statements about the curb, without any attempt to support them by mechanical principles. The following are selected as pertaining to the foregoing criticisms: "It is very clear that the narrower the chain is made the more likely is it to cause pain, which is just what we want to avoid, and we should, therefore, endeavor to make it as broad as possible." "In order to render the action of the curb as painless as possible, it is absolutely necessary that it should press upon the greatest extent of surface that can be made available for the purpose, for which reason, of course, we require this instrument itself to be flat and as broad as the chin-groove will allow." "To reduce pain resource is now had to a particular form of curb and not to any special order of lever."

The opening pages of Chapter IV. convey incorrect ideas as to the relative action of different bits, and in one instance expression has been given such ideas, so as to apparently support the statements above criticised. Reference is made to an article which appeared in

the CAVALRY JOURNAL for December, 1892, under the title, "Graphic Comparison of the Action of the Shoemaker and Dwyer Bits," by Lieutenant ROCKENBACH, Tenth Cavalry. The conclusions arrived at in this article cannot be maintained, for the reason that they are based upon an assumption which is incorrect, namely: that the distances passed over by certain points represent the forces transmitted



to those points. To illustrate: In this diagram, the point *O* represents the bars of the horse's mouth, *D* the attachment of the curb-strap to the bit, *E* that of the reins, and *G* the chin-groove; the lever arm of the force applied at *E* is *EO*, 3.5 inches, that of the resistance at *D* is the perpendicular distance from *O* to the line *DG* or 1.24 inches. The point

E moves 4 inches, or to use the unit of the article, $\frac{8}{10}$ inches; the point *D* moves $\frac{1}{10}$ of an inch; hence, from the principle of the lever we would have $3.5 : 1.24 :: \frac{8}{10} : \frac{1}{10}$ or $1.75 = 4.96$, which is absurd. Again, the point *O* moves $\frac{3}{8}$ of an inch, which represents, comparatively, the force applied to the bars of the horse's mouth. The pressure thus represented cannot be correct, even comparatively, for the reason that this force cannot be, from the action of the lever, always greater than that acting perpendicularly at the point *E*, and it exceeds this latter force by the perpendicular component of the resistance which acts in the direction *DG*. This component and the corresponding component of the force applied at *E* are two parallel forces acting on the same side of the bit and in the same direction, hence their resultant, whose point of application is *O*, must be the sum of the two. The relations between the forces acting on the bars of the mouth and chin-groove with the Dwyer and Shoemaker bits are given as 22 to 10, and 22 to 26 respectively, while the correct relations of these forces are 15 to 10 and 18.75 to 13.75. See Fig. 4 and 7, herewith.

In illustrating the principles of the lever as applied to the bit, it has thus far been assumed that the forces in question acted in a direction perpendicular to the bit; it is now proposed to discuss them as they are found in practice and under several different conditions. It will be assumed that the height of the bars of the horse's mouth is, as given by Major DWYER, $1\frac{1}{2}$ inches; also, that in each case, the force applied at the reins is such that its component perpendicular to the axis of the bit is five pounds. The dimensions of bits and intensities of forces are drawn to scale.

Fig. 4 represents, in diagram, the Dwyer bit, in which *AC* is 3.5, *CB* 1.75, and *CD* 1.75 inches. Pressures are determined as follows:

The force, five pounds, applied at reins, is to resistance offered by curb-strap at *B*, which we will call *X*, as the lever arm of the latter, 1.24 inches, is to lever arm of former, 3.5 inches, hence $X = 14.41$ pounds; since its line of direction is oblique, by resolving it, in accordance with the principle of the parallelogram of forces, into its perpendicular and parallel components, we find them to be ten pounds each, the former representing the pressure on the chin groove. As previously stated, this component and the corresponding component of the force at *A*, in this case five pounds, are two parallel forces acting in the same direction; their resultant is, therefore, the sum of the two, or fifteen pounds, and since it passes through the point, *C* would be the pressure on the bars of the mouth.

With reference to the other component, ten pounds, determined above, it will be seen that if the point *D* were perfectly free to move, this force would have a tendency to raise it vertically upward; if the point *D* be fixed, this force acting in the direction of the axis of the bit, would have a tendency to move it vertically downward. Since the construction of the bit requires for its proper action that the point *D* be fixed, it will be so regarded. The bit is prevented from moving downward under the influence of this force by cheek-straps, and there would therefore be a pressure of ten pounds transmitted through them to the horse's head as the result of a five-pound pull on the reins.

In Fig. 5 the upper arm of the bit is half as long as that in Fig. 4, or .875 of an inch. We find the following pressures as the result of this change: On the bars of the mouth, 25.00 pounds; on the chin-groove, 20.00 pounds; on the head, 10.02 pounds. In Fig. 6 the upper arm is equal to the lower; Pressures on the bars of the mouth, 10.00 pounds; on the chin-groove, 5.00 pounds; on the head, 10.11 pounds. In Fig. 7 we have the dimensions of the Shoemaker bit: *AC* is 5.5; *BC*, 2, and *CD*, 1.75 inches; pressures are: On bars of mouth, 18.75 pounds; on chin-groove, 13.75 pounds; and on head, 15.67 pounds. It will be seen that the arithmetical sum of the forces brought to bear on the horse by the action of the bit is, in the first case, 35 pounds, of which 42.8 per cent. acts on the bars, 28.6 per cent. on the chin-groove, and 28.6 per cent. on the head; in the second, the total is 55.02 pounds, of which 45.44 per cent. acts on bars, 36.35 per cent. on chin, and 18.21 per cent. on head; in the third the total is 25.11 pounds, of which 39.82 per cent. acts on bars, 19.91 per cent. on chin, and 40.27 per cent. on head; in the fourth the total is 48.17 pounds, of which 38.92 per cent. acts on bars, 28.53 per cent. on chin, and 32.53 per cent. on head. To com-

pare the *relative* "severity" of the Dwyer and Shoemaker bits, we find as follows: With Dwyer bit: Pressure on bars, 18.04 per cent.; on chin-groove, 12.02 per cent., and on head, 12.02 per cent. With Shoemaker: Pressure on bars, 22.55 per cent.; on chin-groove, 16.53 per cent., and on head, 18.84 per cent. The weights of the bits have not been taken into account, and as the latter is the heavier, its head pressure would be proportionally increased.

It is interesting to note, in passing, the changes in these pressures due to the play of the curb; that is, the space usually deemed necessary to be left between the curb-strap and chin when the bit is at rest. If this space be such that the finger may be easily inserted in it, it will not be far from half an inch; due to this alone there will be with the Dwyer bit a loss of pressure on the chin-groove of 24.5 per cent., and on the bars, 26.6 per cent; this would be equivalent to a length in the upper arm of the bit of two and one-fourth inches, thus destroying that correspondence in the two dimensions—length of upper arm and height of bars of mouth—said to be of so much importance, and which thus appears to demand a very snug-fitting curb-strap; there is, moreover, a downward pressure on the chin, and an upward pressure on the bars of the mouth, which would appear to be more injurious than beneficial. (*See Fig. 8.*)

To complete the discussion there is yet another point to be considered, namely, the proper relation between the arms as well as their actual length. This phase of the subject is approached with much hesitancy for the reason that there are several variable quantities, to some of which it is necessary to assign arbitrary value before the problem can be solved. These arbitrary values depend upon individual judgment, which, in turn, depends upon a knowledge of the anatomy of the horse's head and an extended experience with the use of the curb bit. Information in this regard has been obtained from those sources which are thought to be most reliable. Since the values which may be assigned these variables are likely to differ with each individual who attempts the solution of the problem, the conclusions below are submitted as provisional only.

The most important variables referred to are—

First—The amount of force that should be applied at the bars, or that necessary to ensure to the rider perfect command over his horse under circumstances incident to the service; this is regulated with a bit of given dimensions by another variable—the amount of force applied at reins.

Second—The relative sensitiveness to pressure of the chin-groove and top of head.

Third—The length of lower arm as limited by conformation of mouth and line of direction of reins.

Fourth—The length of upper arm as limited by the means of attachment and proper working of the curb-chain.

If it be accepted as a fact that the upper arm of the bit should be equal to the height of the bars, which is said to be of easy mathematical demonstration, the fourth variable might be omitted. This demonstration is, however, by no means apparent. It is stated that "if a flat curb-chain which has a proper width act in this groove, a considerable amount of pressure may be applied without causing any very unpleasant sensation to the horse," and that "the entire action of the bit should be concentrated on the mouth-piece." Referring to the appended diagrams it would appear that a mathematical demonstration would be strongly on the side of a bit in which the relation between the arms approached that given in Fig. 5, for we there have the greatest concentration of pressure on the mouth-piece and the least on the head. It is true we also have a greater pressure on the chin-groove, but, as stated above, this may be considerably relieved by a proper form of curb-chain. The top of the head is popularly believed to be one of the most sensitive points about the horse, and, in fact, it is so held by authorities on the subject, who also state that pressure upon this spot is one of the causes of disease. (See FITZWYGRAM, and Special Report on Diseases of the Horse, Department of Agriculture, 1890.) For this reason it is thought the upper arm of the bit should be as short as possible; if this length is reduced unduly it would interfere with the proper function of the curb-chain, by bringing the latter, in consequence of its width and the yielding nature of the bars and chin-groove, in contact with the joint of the mouth piece and arms, when, as is sometimes necessary, a strong pull is applied to the reins. As to the total restraining force that should be supplied by the reins—a variable to which an arbitrary value must necessarily be assigned—it will be assumed, in the absence of a better guide, that the amount given by the Dwyer bit is sufficient, this assumption being based solely upon the favor with which the bit has been received. Comparing the *relative* power of this bit with those represented in Figs. 5, 6 and 7, it will be seen from the following table that they stand as follows: 38.89 to 61.11, 58.23 to 41.77, and 42.08 to 57.92 respectively.

	<i>Dwyer and Fig. 5.</i>		<i>Dwyer and Fig. 6.</i>		<i>Dwyer and Shoemaker.</i>		<i>Dwyer and Size 1.</i>		<i>Dwyer and Size 2.</i>	
Chin	10.	11.11	10.	16.64	10.	12.02	10.	14.29	10.	14.74
Head	10.	11.11	10.	16.64	10.	12.02	10.	14.29	10.	14.74
Bars	15.	16.67	15.	24.95	15.	18.04	15.	21.44	15.	22.12
Relative power....	38.89		58.23		42.08		50.02		51.00	
Chin	20.	22.22	5.	8.31	18.75	16.53	10.71	15.30	10.	14.74
Head	10.	11.11	10.11	16.82	15.67	18.84	8.56	12.23	7.83	11.54
Bars	25.	27.78	10.	16.64	18.75	22.55	15.71	22.45	15.00	22.12
Relative power....	61.11		41.77		57.92		49.98		48.40	

In other words, the "severity" of the first and third is excessive, while the second is deficient in power.

From measurements taken of a number of horses of Light Batteries "A" and "F," Second Artillery, it appears that for a large proportion a length of three inches for the lower arm would give sufficient play between the horse's lip and bar connecting the arms of the bit. With this as a value for the third variable, we have sufficient data from which to determine the remaining dimension — length of the upper arm; this is found to be 1.4 inches, the relative power to our assumed standard being with this bit as 49.98 is to 50.02, or practically the same, while the relative pressures on top of head are as 12.23 to 14.29. In other words, the bit with these dimensions fulfills the assumed condition of affording sufficient restraining force, while the pressure on the head where it is most harmful is reduced to a minimum. From the same measurements it would appear that the height of the bars is about that previously used, or 1.75 inches; with two of the largest horses, each weighing over 1,300 pounds, this height was found to be 2.25 inches, and the distance from the proper position of the mouth-piece to lower edge of lip was four inches; for these horses, therefore, the bit would, to come within the limits of the assumed standard, require a length of four and two inches for lower and upper arms respectively.

It is said to be of special "importance that the portion of the mouth-piece destined to rest on the tongue and the bars respectively should keep their proper places, and that this can be secured only by making the mouth-piece of precisely the same width as the horse's mouth." It is evident that to comply with this requirement would, for service purposes, be impracticable, but it is as clearly manifest that some effort should be made towards an approximation to this condition. The width of the mouth appears to be very variable and to bear no proportionate relation to other measurements taken; the largest horses did not have the widest mouths, although they

were considerably wider than those of the medium and smaller horses. The greatest dimension noted in this regard was five inches, the smallest 3.75 inches, while others varied between these limits by small gradations. In "Bits and Biting," the assertion is made that "the width of the tongue-channel is very constantly three-fourths the height of the bars, which gives as a maximum width of port one and one-third inches." This is by no means sustained by measurements taken here; on the contrary, the tongue-channel appears to vary directly with the width of mouth. While a limited experience in this regard will not warrant a positive statement as to the proper width of port, it does, however, suggest that for the widest mouth this dimension should be about two inches, with a proportionate reduction for those of less width.

It is at this point proper to note one of the most marvelous statements to be found in equipment literature. Quotation is made from Ordnance Memorandum, No. 29. "The width of arch of mouth-piece is 1.9 inches for all bits. *There are three grades of severity for the bit, determined by the height of the arch of mouth-piece.*" Comment on such an absurdity is a waste of time.

If the premises upon which this discussion rests be correct it would seem that bits should be furnished for service purposes in two sizes as far as the length of the upper and lower arms are concerned, and in at least four widths irrespective of these sizes. The following dimensions are tentatively suggested:

	Sizes.		Width of Mouth-piece.	Width of Port.	Bearing on Bars.
	No. 1.	No. 2.			
Upper Arm	1.4"	2."	A. 3.75"	1.5"	1.12"
Lower Arm.....	3."	4."	B. 4."	1.6"	1.20"
			C. 4.5"	1.8"	1.35"
			D. 5."	2."	1.50"

There is no good reason why this important matter should not receive the same attention as other parts of the equipment issued in sizes to suit the horse.



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Fig. 10

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Fig. 8

Fig. 7

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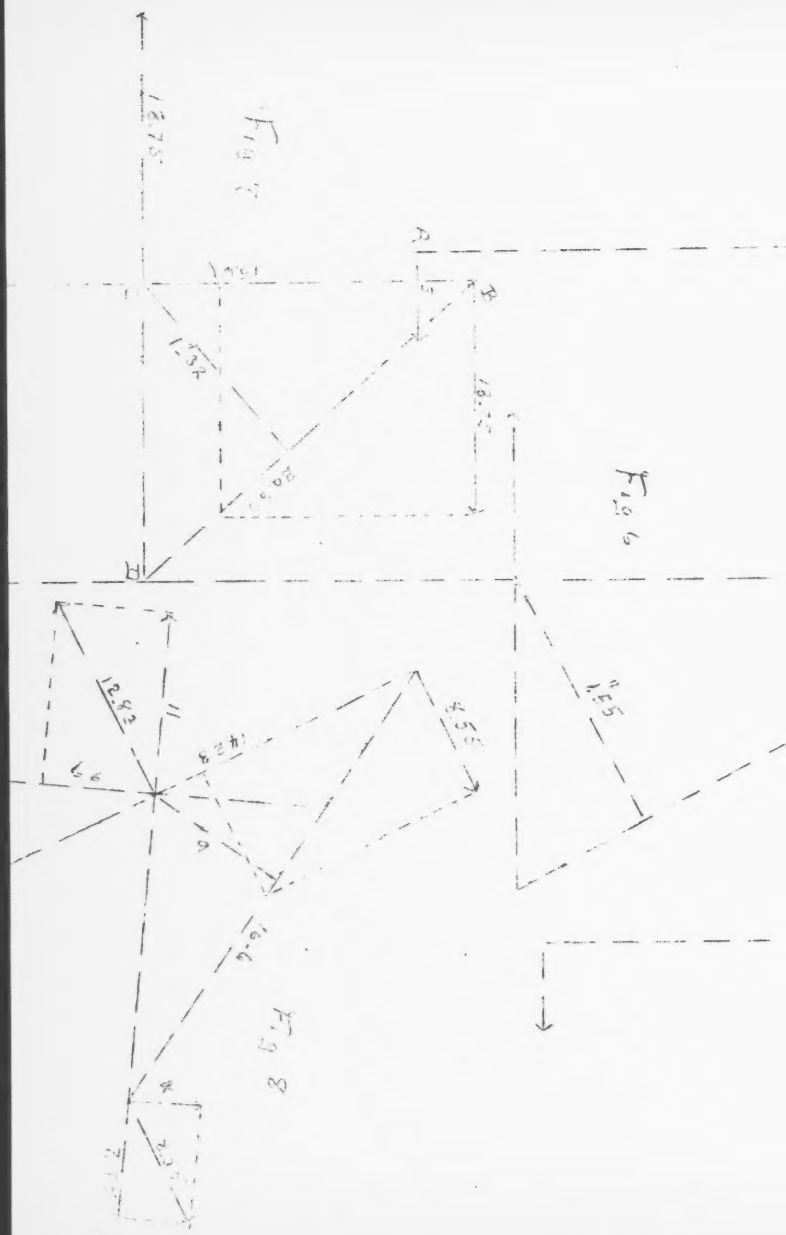
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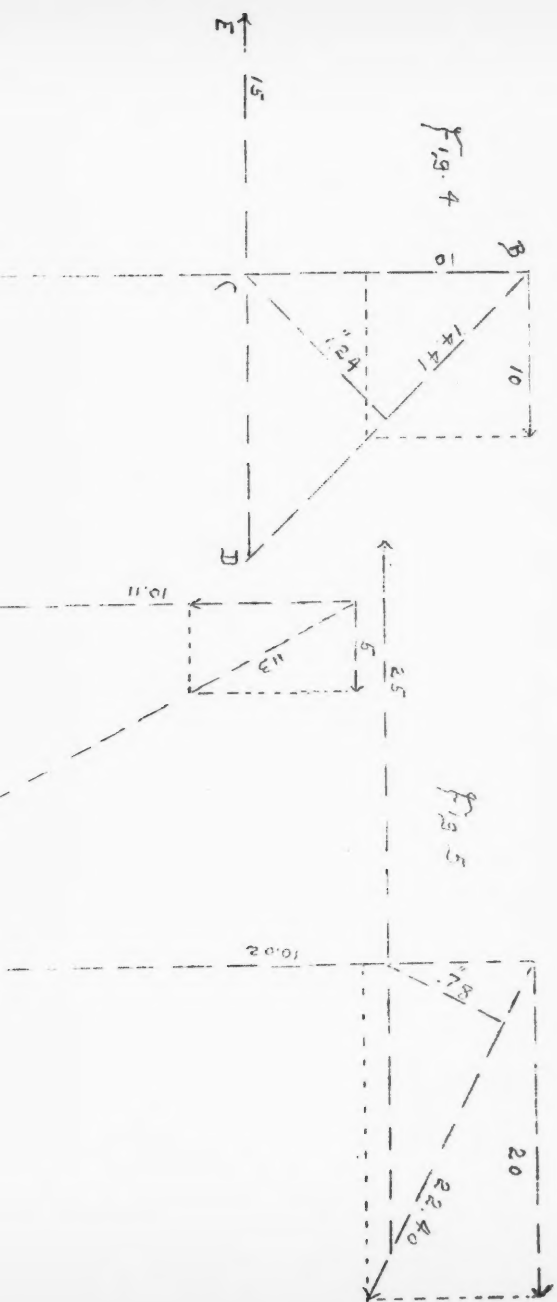
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CONVERSATIONS ON CAVALRY; BY PRINCE KRAFT ZU
HOHENLOHE-INGELFINGEN.

TRANSLATED FROM THE GERMAN,
BY FIRST LIEUTENANT CARL REICHMANN, NINTH INFANTRY, U.S. ARMY.

EIGHTH CONVERSATION, (FEBRUARY 21, 1886).—PROGRESS OF THE
CAVALRY FROM 1843 TO THE PRESENT TIME.

H. Toward the end of our last conversation we had sufficiently discussed the work on the track and in the circus to be entitled to-day to some exercise in invigorating air.

S. And we had reached the period when WRANGEL broke in among old peace practices like a fresh breeze on stagnant air.

H. Yes; the cavalry exercises near Berlin, which he directed in 1843, ushered in a new era for the German cavalry.

S. In the work which you have cited, KAEHLER gives an excellent condensed review of his activity and work when he was the acknowledged highest authority of the cavalry, although not at its head.

H. It is very interesting to observe how, in the time from 1843 to 1863, WRANGEL's ideas gradually underwent a change. In 1843 he drilled a large body of cavalry, during the first few days, according to dispositions previously made and communicated to the troops; afterward he forbade this practice expressly, and ordered that none but extemporized off-hand exercises be had. In 1843 he had the cavalry regiments retire, in skirmishing order, through the intervals of the advancing columns. Later on this was abolished as impracticable in presence of the enemy, and the echelons in rear now had to attack the wing and flanks. Nor did he at a later date use such deep formations as in 1843, while in 1863 he speaks of drilling in single rank. In his old age, I heard him say with a sigh, that he had survived himself, and considered everything he had formerly instituted as wrong, and that he had become convinced that on account

CONVERSATIONS ON CAVALRY.

of the increased fire effect of the other arms, cavalry could not act except in single rank.

S. It is a proof of WRANGEL's insight and talent that he was still capable of keeping abreast of the time, even in his advanced age, and modifying his ideas in accordance with the latest experiences, as well as improvements in arms. In 1843 there clung to him some of the things, which during the past quarter of a century, he had not seen done differently, nor been allowed to do differently. A practice of twenty-eight years could not well remain without some influence on the actions of a man who suddenly came into a position to develop himself freely.

H. WRANGEL's work is characterized by the cavalry exercises of 1843, next in his essay of 1851, which acquaints the army with his ideas, after he had been deputed to inspect the Prussian cavalry regiments. This gave him the duties of an inspector-general of cavalry without being commissioned as such. Next followed the cavalry exercises of 1853, the new regulations of 1855, and his "Comments," etc., of 1863.

S. In the first cavalry exercises WRANGEL merely practices the employment of masses as a whole, and the forms similar to those proposed by THIELEMANN, BORSTELL, ZIETHEN and BLUECHER shortly after the Wars of Liberation. A proof of WRANGEL's far-sightedness is that already at that time he was preparing the grave for the cumbersome division column in the regulations, and placing more value on dismounted fire action.

H. In 1851 he placed the chief value on the rider spirit. It is also to be noted that here for the first time the individual training of the man is insisted on by the highest cavalry authority. He explains how the inspection is to be made and eschews all evolutions which have not the charge for their end and aim.

S. The ability to pass over long distances at a gallop and the endeavor to gain the enemy's flank, are likewise matters on which he lays stress. In this way he materially promoted the true cavalry spirit.

H. Lastly, we find in the "Comments," the three line tactics laid down for the first time as a fundamental principle, while there is expressed a desire for cavalry corps of from ten to fourteen regiments, and annual exercises of such corps.

S. I do not consider these as his most happy ideas, for it is easy to conceive situations where it is better to charge in two lines than in three, nor have cavalry corps of a strength of fourteen regiments proved a success in war.

H. In the year 1853 followed the great cavalry exercises with sixty-one squadrons, near Berlin. I took part in them myself. In view of my subordinate position of chief of section among the great mass of artillery, I cannot presume to give a judgment on the exercises as a whole. But I could not free myself then from a feeling of disappointment. From what I had read and heard of the exercises of 1843, I had expected those of 1853 to be brisker and livelier.

S. This would likewise appear from KAEHLER's work. He names as the cause the presence of seventeen landwehr squadrons, whose efficiency, especially in strength and training of horses, was not what is required of cavalry. I also believe that the mass was too large to admit of uniform leading.

H. The most important result of these exercises was the regulations of 1855.

S. They at least regulated the gaits, definitely introduced squadron columns and regulated the charge.

H. KAEHLER calls the cavalry exercises of 1853 and the new cavalry regulations of 1855 the beginning of a new era. I should place this beginning in the year 1843, when WRANGEL's influence began to become more generally felt.

S. The most excellent thing handed down to us by WRANGEL is, in my opinion, his "Comments" of 1863, on the training and use of cavalry. He demands in the first place one common principle and an inspector, to insure its observance. He renews the old principles of FREDERICK THE GREAT, which require the horses to be ridden in the open in winter, thereby assuring the health of the horses. He likewise lays stress on individual riding, and calls to mind the Great King's principle of every day being lost on which the rider does not exercise his horse. As already stated, he forbids the issuing of dispositions before the drill, and wants none but extemporized exercises. Lastly, he wants the inspections to be made unexpectedly. He well knew the evil consequences of regular inspections, with previously fixed limits of the time of training, causing the work, the drilling, to be done solely with a view to the inspection, as I have frequently stated.

H. I consider the manner in which WRANGEL introduced his opinions and ideas as valuable as the ideas themselves. It was this manner that brought life into matters.

S. WRANGEL's singular personality is known to and popular with all.

H. WRANGEL's popularity rests to-day, I regret to say, more in the remembrance of the last ten years of his life in which he had

survived himself, and in which he was conspicuous by his wit and his droll appearance, than in his weight as a military authority.

S. Thoughtful soldiers will never forget his merits.

H. Yet any one in thinking of WRANGEL, has in mind the picture of the droll old man as he was in his ninetieth year, rather than his appearance as a keen cavalry general of sixty years. In those days the small, dry, lean old man, firmly seated without stirrups, as though one with his horse (he invariably rode without stirrups, until in his old age he thereby contracted an injury) came riding up with his sour face, and criticised everything with biting sharpness. Every one of his words was funny, and his criticism all the more pungent. He had absolutely no regard for persons. When he found anything to criticise, it was a matter of utter indifference to him who was concerned. Considerations for former meritorious service, for fathers of families, for age, he knew not. It was said that he had a stone in the place of a heart. If any one appeared to him not active enough on horseback, he expressed his regret at not seeing him again, and urged his removal from active service. He dispensed arrest with great liberality.

S. He did not earn much popularity in those days.

H. Not with the old generals and regimental commanders. They feared and hated him. He removed them. But the young, aspiring generation in the cavalry which had not been sufficiently pedantic to suit these old leaders, and had been prevented by them in the furtherance of smart cavalry service, liked the old WRANGEL all the more, as his severity brought promotion. His wit was amusing and his severity rarely descended on the head of individuals among the young gentlemen.

S. The best means of becoming popular among the young men is certainly to get them promotion.

H. Add to this that WRANGEL was interested in everything connected with smart riding. He was never absent from the races, he rode in the hunts and tormented no one on the riding track with pedantries of form. He indicated the object of cavalry, the state of efficiency it was to endeavor to reach. He met with response from the young generation which went to work and reflected by what means to accomplish this purpose. Without this active and forcible interference on his part, his words, orders, dispositions and writings would have remained dead letters, as likewise all his efforts would have been without lasting result, but for the coöperation of the then young generation.

S. The most lasting effect was, that among this generation he

was training a pupil, who became his immediate successor as the head and highest authority of the cavalry.

H. You mean Prince FREDERICK CHARLES. Before passing to him I would like to speak to you of another appearance in the cavalry world which, at the time when WRANGEL's days of glory were nearing their end, was much talked of, I mean EDELSHEIM's system of individual training.

S. EDELSHEIM brought his ideas forward just at the right time, when WRANGEL emphatically pointed out the importance of good individual training for the efficiency of a mass of cavalry. In those days every one chiefly occupied himself with individual training.

H. Did not EDELSHEIM neglect individual training?

S. What makes you think so?

H. I remember that three officers of the Guard Corps went to Vienna to study EDELSHEIM's system. This bold hussar leader had become the topic in all cavalry circles by his brilliant charges at Magenta and Solferino in the campaign of 1859. What I heard from these officers was to the effect that EDELSHEIM considered our horses overtrained, and that they should be left more nearly in their natural state.

S. Whoever says that of EDELSHEIM, has misunderstood him. EDELSHEIM did, as I do now, recognize that our horses were too much mistrained. He saw that paces were called "Shulterherrein," "Travers" and "Renvers," that were no side paces at all, but a stumbling about in unnatural movements. He abolished such a tormenting of horses. He preferred to gain, and did gain, the balance of the horse by increasing and decreasing the paces on a straight line instead of by ruinous cross-stepping in faulty lessons.

H. So far as I know, he did not care to bend the horse's back by side paces.

S. Because the Hungarian horses furnished a material whose temper and character were not well suited to high training, and inclined to resistance, when much annoyed by "kniebeln" and premature use of spurs; EDELSHEIM knew that well, and very correctly adapted his method of training to the race. He reduced the riding of side paces for the very reason that his work was much more thorough than had been the case heretofore. In this he is in thorough accord with PLINZNER, who considered it wrong to give a horse a more oblique position in and for the side paces than it is capable of by previous training.

H. What do you say to the training of riders on the longe? So far as I know, it has been introduced throughout the Austrian army.

S. This training of the recruit on the longe may prove to you how thoroughly EDELSHEIM wants individual training carried out; it indicates that he knew the high school well. As the scholar of the high school had to learn between the pillars and without reins how to sit on the school horse, which moved at the motion of the instructor's whip, so EDELSHEIM puts the recruit on the horse which is led by the longe, without reins, and arms crossed behind the back. In this way he prevents the rider from giving the horse a chuck in the mouth every time he becomes unsteady in his seat.

H. It is true that the poor recruit horses suffer much rude, though involuntary, pulling of the reins when the recruit fears he is falling off.

S. So much, that if the poor beast is not already a chunk of wood, devoid of feeling, it soon will be; furthermore, EDELSHEIM does not put the reins in the hands of the recruit until he has become firm on the horse on the longe with hands behind the back, until his seat is firm. You see, he works very thoroughly, very systematically; he gains thereby much for the further training of the rider, for when the recruit does not get the reins in his hands until his seat is firm, it never occurs to him afterward to hang on by the reins to keep his seat, while it costs much time to break the recruit of this bad habit when once acquired, because he had to handle the reins the very first day.

H. I wonder where EDELSHEIM gets the instructors and the time to carry out this instruction.

S. Of course there are not enough non-commissioned officers for instructors, and men must be used who are serving in their second and third year. But the time is easily made up, for a recruit who is not instructed in the handling of the reins until he can sit by himself, correctly and firmly, learns much quicker how to handle the reins well and properly. I wish to refer you here to one of BAUCHER's principles: "*Plus vous allez lent, plus vous irez vite.*"

H. You seem to advocate that we should likewise teach the recruit the seat with the use of the longe, and without reins, before putting the reins in his hand.

S. I should not object if this method were introduced; I realize, however, that it would be difficult to get such a radical change in the system of training adopted; moreover, a rational use of whip and longe is likewise difficult, and the chief difficulty would be that we have not enough men who understand it. We have other means, however, to turn, at the beginning, the recruit's attention to the

seat alone, and for this reason I do not place such weight on the introduction of this method of training recruits.

H. I reserve to myself the privilege of questioning you thoroughly on this subject later on; let us now return to the thread of our conversation and discuss the further development of the cavalry under the influence of Prince *FREDERICK CHARLES*.

S. This eminent Prince united in himself many qualities which enabled him to exercise the most favorable influence on the further development of the arm. His military passion, his restless activity, his high personal position in the reigning family, and his rich experience gathered in the course of promotion in peace time as well as in the field before the enemy, could not but make him the proper man for improving the army, even had he been devoid of natural gift.

H. You have failed to mention a certain smartness and eagerness which in a true horseman must never be lacking and which were in his blood; when quite young this eagerness caused him in the *Baden* campaign in 1849 to throw himself upon the enemy far in advance of the charging squadron, where he was wounded and some of his suite killed and some wounded.

S. That charge was much talked about at the time.

H. Much and severe criticism was pronounced; he was blamed for being the cause of the death of some officers, which it was said he had caused by his youthful ardor. It was chiefly from those discreet old men who wanted cool deliberation alone, and were opposed to bold daring on his part.

S. It was asserted at the time that he had drawn the squadron into a senseless charge.

H. His opponents said so, but it was not the case; the squadron meant to pursue the retiring enemy; the Prince asked permission to take part in the charge, for he had no command in that campaign. He placed himself at the head and charged on the enemy; the squadron followed, but could not ride as fast as the better mounted officers, who remained with the Prince; thus he and the officers together received the volley. The squadron of not more than 100 riders following in rear made 250 prisoners. Is that a senseless charge? Fortunately the King, informed of the actual facts, rewarded the Prince, who had been wounded by two bullets, and thus did not smother his incipient ardor, as the fault-finders would have been glad to do.

S. It is of the greatest importance that independence and boldness in the cavalry be ever encouraged by praise, though it may afterward be sometimes discovered that too great a risk had been taken.

H. Initiative and boldness are always better than a too long waiting for orders and the missing of a favorable opportunity.

S. In 1863 we find him again as commanding general and successor of WRANGEL in the command of the Third Army Corps, after having previously commanded a squadron, a regiment, a brigade and a division. At the cavalry exercises under WRANGEL, in 1853, he was already in command of a brigade.

H. It is hard to define what improvements of the arm are to be ascribed to him personally, though we all still have in mind how continuously and indefatigably he worked, for there exist but few writings by him.

S. We find enough in the instructions and orders he gave, and which we read in KAEHLER's book. There you find—and it suffices for us and supports the ideas I have formed—the following: He laid the greatest stress on individual training; he would not have the echelons in rear charge except on the flanks and in a slanting direction; he deprecated all formalism, and held every leader responsible for choosing such a formation and method as to reach his aim with the least expenditure of time and energy; he strove for simplicity of the evolutions; he made the independent riding of the individual man the chief object of the training; he did not rest contented with a good drill on the level drill ground, but demanded equal precision in the evolutions on the terrain. In the instructions for his corps, in 1861, he wants the drill made sharp and short; he demands that the horses be exercised even on days of rest, and thus renews the principles of FREDERICK THE GREAT. New for that time, was the requirement to drill in single rank, to charge with the squadron inverted, to develop the full speed and to regulate by order the heretofore forbidden English trot, when trotting at ease under the name of "easy trot." In the regulations issued by him he likewise was ahead of his time, and made the platoon column the one chiefly used, which the regulations of fourteen years later introduced for squadron and regimental columns. Lastly, he considered it necessary to bring to mind the importance of the closeness of the charge, and to emphasize it again and again.

H. These decisions of the Prince belong to a time when he was not as yet at the head of the cavalry as its inspector-general, to which position he was not called until after the War of 1866 had demonstrated that the cavalry did not have that share in the success which had been expected. After this time it is impossible to ascertain what measures are to be ascribed to his activity. KAEHLER himself, a great admirer of the Prince, says that his appointment as inspec-

tor-general did not quite fulfill the hopes entertained by the cavalry branch of the service.

S. Considering the position of the Prince within the royal family, it is natural that as yet it cannot be ascertained what improvements are to be attributed to him and what to other, still living, influential persons. Any way, it cannot but be assumed that he took a due share in everything that was done. In the War of 1870 KAEHLER says one of the first things he did was to push the cavalry under his orders on the enemy with orders to stay there. In this way he initiated that role of our cavalry of which you spoke with so much praise in your letters on cavalry in the campaign of 1870. Furthermore it is not possible that in his inspections the Prince should have exerted any influence on the cavalry as a whole other than in the sense of the instructions of 1861 and 1863, drawn up by him for his corps. The essential changes in the cavalry, the work of the STOLLBERG cavalry commission, the project of regulations of 1873, the regulations of 1875, must have been suggested by him.

H. The cavalryman most frequently mentioned in and after the War of 1870 is General von SCHMIDT.

S. And how much did the Prince do to make General von SCHMIDT's ideas prevail. It was chiefly due to the Prince's efforts that his collected instructions were printed on account of their high value, as expressly stated in the introduction.

H. SCHMIDT certainly was one of the most prominent cavalrymen of the last few decades.

S. His energy in war and his capacity for leading large bodies of cavalry cannot be denied.

H. Yet he had many opponents.

S. They belonged in great part to the remnants of those adherents of the principles prevailing from 1815 to 1845, who would like to make riding in the square and in the circle the end and aim of all cavalry work.

H. He was found fault with for ruining too many horses.

S. It is true, SCHMIDT makes some demands in this direction which, in my opinion, go too far, for SCHMIDT was more a drill master of masses of cavalry than a moulder of the individual, especially the horse. The damage done, however, is more due to his admirers and all those who misunderstood him, than to himself.

H. On the occasion of his death, I heard one of our most influential officers make the remark that the death of this brilliant leader had perhaps saved the lives of several thousand horses.

S. That is not impossible, for every great master has pupils who

imagine that they can surpass him by going farther in his direction than he does. As SCHMIDT, in his demands, approached the limits of the possible, any step beyond must do harm.

H. The improvements made in the cavalry after the war can be epitomized under the following heads: 1. Care in the training in reconnaissance service, by the instruction of officers, as well as by rendering the horses capable of long continued rapid movement; 2. Definite, but elastic rules for the leading of large bodies; 3. Greater mobility of the masses by the introduction of the squadron column, regimental column, dressing toward the center in platoon and squadron, removal of the term inversion and of all evolutions which have no tactical, warlike purpose; 4. Importance attached to individual training and individual riding; 5. Armament of the cavalry with a long range fire-arm and thorough instruction of every horseman in firing.

S. It is not to be denied, that the work was carried on incessantly and with much insight.

H. Since you acknowledge that, I am curious to hear, in detail, the objections you have to make to the encomiums I have bestowed on the cavalry. It would be preferable, if you would communicate to me the system which you would use for the training of the troops.

S. It never occurred to me to introduce a new system—to become a reformer. The improvements which I desire I have already touched upon. If you wish to hear them recapitulated and substantiated, you must ask me questions of detail.

H. Good! I shall try to arrange my questions systematically and begin to plague you with them the next time.

CAVALRY EXTENDED ORDER FORMATIONS.

BY CAPTAIN JAMES PARKER, FOURTH CAVALRY, U. S. ARMY.

IN prescribing a system of extended order for cavalry we are confronted at the outset with the fact that such a system finds its principal and almost only use, dismounted. This fact is as clearly indicated by experience as by the plain conditions under which cavalry must always fight. It is not necessary to cite history to show that cavalry cannot fight effectively with the carbine, mounted; nor is it of advantage to go into a long discussion to show how a horseman on a skirmish line affords to the hostile rifleman an easy mark, and possess little power of retaliation.

These facts are plainly enough admitted in the regulations themselves, where, on page 367, the following brief and restricted rôle is assigned to mounted skirmishers: "They are principally used to clear and beat up wooded localities, in conveying supply trains, and in partisan or Indian warfare." The regulations might well have added: "Mounted skirmishers should never be used when it is desired to kill or wound the enemy."

A system of skirmishing should be modeled on the needs, not of a mounted, but of a dismounted force, since it then finds its principal use. Our regulations should speak with no uncertain sound on this point.

During the War of 1861-5 our leaders discovered what was then a new rôle for cavalry and which has added enormously to the value of that arm. What they discovered and developed let us not lose sight of. Some people dub, contemptuously, cavalry trained to fight on foot, "mounted infantry," but it requires merely an absence of overruling prejudice and a little common sense, to be *convinced* that a force which can fight effectively on foot as *well* as on horseback has gained enormously in value as a weapon of offense. Cavalry which can fight on foot can be independent, self-reliant, though not

less swift. As an advance guard, a rear guard, a flanking force, a raiding force, cavalry must hereafter be prepared, mounted, to meet cavalry with the saber; and dismounted, with the rifle to capture and hold positions, to resist infantry and to attack infantry.

To state the principle again, skirmish action is a method of fighting dismounted, which finds a very rare and somewhat doubtful application mounted. It is evident, then, that a system of skirmishing should be based upon the needs of dismounted troops, not on the needs of the horse and rider. The size and composition of the fire unit, the method of deployment, must be arranged with reference to dismounted, not mounted fighting.

Again, for obvious reasons, *simplicity* is a paramount necessity in all systems of tactics. But especially is it for a drill book, which is intended to embody a course of training for the hastily raised volunteer forces of the United States. Wars are entered upon quickly in these days, and when our time comes we shall have no time to lose in studying intricacies. We *must* have a drill book that is simple and easy.

It must be admitted that in these respects there is much to criticize in the drill regulations of 1892. The system is a system of mounted skirmishing made adaptable to dismounted skirmishing, when occasion shall arise. Intricacies of deployment, which are unnecessary even when mounted, are retained in dismounted action, destroying simplicity of command and execution, and vastly increasing the perplexities of squadron, troop and group commanders. Take a troop in line, for instance, we find in the drill book a method of deploying to the front, and also a method of deploying to the flank, the latter being simply a restricted deployment to the front. Here are two methods when one would be sufficient. The troops in column of fours also may deploy to the front or by the flank. The deployment in these cases may be by individual skirmishers, or else by squads, the squads afterwards deploying by skirmishers. The first of these was not needed. The chief of each squad may (and he is in certain cases allowed considerable discretion) deploy his squad into line of skirmishers by the following different commands: Being in line: "*As skirmishers, right (or left) front into line, MARCH.*" (Note the clumsiness and paradoxical nature of this command.) "*As skirmishers, right and left into line, MARCH.*" "*As skirmishers, fours right (or left), trot, MARCH.*" From column: "*As skirmishers, right (or left) front into line, MARCH.*" "*As skirmishers, to the right (or left), MARCH.*" Here are nine different ways in which a squad may be deployed. In some of these the base file halts; in some he moves

at a walk, and in still others he is required to move at a trot. In some of these deployments, the deployment is made at a gallop, no command being given for the gallop; in another, at a trot, the command, "trot," being obligatory; in still another, at a walk. The troop may deploy on its right squad, its left squad, or the right or left squad of any interior platoon. Intricacy and obscurity are combined in these drill regulations. A captain of cavalry, who is ordered to place his troop mounted in skirmish line at a certain point, facing in a certain direction, has his choice of fifty-four different methods, without taking into account the question of gait.

If we consider the means of deploying a mounted troop to fight dismounted as skirmishers, we discover at once new intricacies. The troop from columns may dismount to fight on foot to the right front and to the left front, to the right and to the left. On dismounting it may assemble in fours, or it may assemble in squads, or it may assemble as a troop. Having determined his choice of these preliminaries, the captain has still to choose from the fifty-four methods of deployment. Or, the captain may deploy the troop mounted into line of squads, dismount the men, and bring back the horses. In truth, it may be said, the captain of a troop has a wide discretion. He may select any one of four hundred odd methods of forming his men, their faces to the foe. It is not to be supposed, however, that his troubles end here. Having determined upon his command, he has still to deliver it, which is never done without considerable exertion on his part. To explain this, let us instance one of the commands of a captain desiring to dismount his men, form line of squads and deploy as skirmishers: "*To fight on foot, action right front, assemble on first squad, first platoon, MARCH. At so many yards, line of squads, on right squad, second platoon, fours right and left, MARCH. Troop, HALT. Squads as skirmishers, right and left front into line, double time, MARCH. Skirmishers, HALT.*" This command contains just forty-seven words. It is true that the captain, by using greater judgment in his selection of one of the four hundred methods of accomplishing his purpose, might have obtained a shorter command, and thus abridged his long-winded discourse. But what are we to say of a drill book which makes such things possible, when bullets are whistling?

It is patent to every one that there is no necessity for all this. The same Board of Officers that ostensibly prepared the Cavalry Drill Regulations, also prepared a drill book for infantry, which contains a system of extended order drill, which, in command and execution, is as simple as our system is complicated. There was no

good reason why our skirmishing tactics (which are primarily intended for dismounted fighting) should not have been essentially the same as the extended order for infantry, but it would seem that the only assimilation that has been practiced is the incorporation into the cavalry of the infantry *squad*, a subdivision which I intend to show is not adapted to the uses of mounted troops.

The squad as a subdivision of a company for purposes of administration, has long been known to our army. By the provisions of Paragraph 259, Army Regulations, each troop is divided into four squads, according to height. The men of each squad are in charge of a non-commissioned officer night and day, who sees that they are orderly and clean. They are quartered together, and fall into ranks together. All this is changed. We are *now* told that when in rank the Army Regulations become void since the Drill Regulations came into play. *These* last require, in case the troop contains four platoons, that each squad now become a platoon, shall be divided into two drill squads. The right drill squad of the first administrative squad becomes, in the language of the drill book, the "right squad, first platoon." This is, to say the least, rather confusing to the enlisted man. Again, each platoon, the drill book says, shall consist of not less than four, nor more than six sets of fours, and each platoon is to be divided into *two* squads. The normal formation of the troop apparently is to be of four platoons, of six sets of fours apiece, making, with trumpeters, guides and chiefs of platoon, three officers and 103 men.

It is difficult to discover why the requirement is made that the platoon should consist of not less than four sets of fours, except for the reason that this drill-squad system made it necessary. It was plainly impracticable to divide a platoon of three sets of fours into two serviceable squads, so the compiler adopted the provision that the platoon shall not have less than four sets of fours. It is apparent to every cavalry officer that this is a blow to the maneuvering facility of the troop. The customary platoon of three or four sets of fours is a most useful subdivision, handy, manageable, able to traverse uneven ground almost as easily as a set of fours, and a good formation to use in marching on streets and roads. The larger the platoon becomes, the more unwieldy it becomes, and consequently the fewer opportunities occur for its use; marching by platoons in streets becomes impracticable. The new *turn*, a movement which might be called "breaking ranks to get around a corner," though objectionable, does well enough when the platoon contains but three or four sets of fours, but when attempted by a small troop or a pla-

toon of five or six sets of fours, especially at increased gaits, there is presented a scene of confusion, hardly to be reconciled in the mind of the ordinary spectator with military precision. Again, the requirement that platoons shall consist of not less than *four* sets of fours, is not applicable to our small troops in peace time. The strength of a troop at drill in the ordinary post is usually six or seven sets of fours, and as a necessity, the requirement is usually disregarded.

But even the purpose intended to be secured by this provision, namely, that the platoon shall furnish two groups or squads of proper strength, is not secured. In "BACHELOR'S Infantry Fire," a work of great merit, endorsed by the War Department, we are told that "these groups should be large enough to prevent the control of the fire from falling into the hands of inexperienced leaders, and small enough to bring each man directly under the eye of his leader. Under a close fire, one man cannot look after more than sixteen at most, and smaller groups than eight men would split up the command too much; hence these may be considered the maximum and minimum, respectively."

Going back to our new drill regulations, we find that our largest platoon of six sets of fours furnishes for dismounted firing two squads of eight men and a squad leader each; and that the smallest platoon of four sets of fours furnishes two squads of five men and a leader. In the first case, the groups are of the minimum strength, according to BACHELOR; in the second, of less than the minimum. This is not all; the normal troop of four platoons or eight squads numbering from 71 to 103 men, would require thirteen non-commissioned officers, *i. e.*, eight for the squad leaders, three for guides, and two for chiefs of platoon. Granting that two of the guides are available for squad leaders, it does not alter the fact that, with the present organization of our troops, we have not enough non-commissioned officers to furnish one to take charge of the led horses, two to command platoons, and eight to command squads, leaving out the question of supplying vacancies caused by casualties. Not the least of the faults of the squad system, as applied to the cavalry then, is its impracticability under present conditions.

What is, then, to be our fire unit? An answer, which easily disposes of all these difficulties, will occur readily to the cavalry officer who has considered the subject. Let our fire unit be *the platoon*. Let the minimum platoon be one of three sets of fours, furnishing a leader and nine men for dismounted work; the maximum, one of five sets of fours, furnishing fifteen men and a leader. The average

platoon will then be of four sets of fours, furnishing a group of twelve men, for fighting on foot. The number of platoons need not then be limited to four. Our group leaders will then be appointed according to rank; not inversely, commencing with the junior corporal, as seems to be the case in our drill regulations. Our groups will, also, as a rule, include an extra non-commissioned officer—one available for command in case the leader is disabled. One lieutenant would naturally have command of the firing line, and the other of the support. But, in case (through the depletion of the troop or other causes) either echelon consists of but a single platoon, the lieutenant with it would act as group leader.

The platoon then should be the cavalry fire unit. But, in addition, to insure simplicity and the idea of leadership, the platoon should be, in the words of our drill book, "*the basis of extended order.*" The integrity of the group should be maintained, not (as in the drill book) only *after* the deployment, but *during* the deployment. In forming a skirmish line, the platoon should be led to opposite its position, and then deployed. There should be no departure from this rule. No possible advantage in time or facility of maneuver is gained by deploying the troop as one group. Two ways of doing the thing should not be adopted when one is enough.

Another reason for simplicity: The commands of the captain and of the major must be given by signal—by trumpet or otherwise. The captain may be 200 yards in rear of the line of groups, the major still further. At that distance the voice is drowned. Even at close distances the noise of musketry makes the use of the trumpet or other signal imperative. All commands, therefore, in extended order, should be capable of rendition by the trumpet. This consideration alone obliges us, in compiling a drill book, to adhere to a few simple movements which are capable of being ordered by signal.

Instead, then, of two systems of deployment, one by the flank and one to the front, let there be substituted one only, the line of squads or of skirmishers to be formed thirty yards in front of the troop. The formation of a line of skirmishers to be as follows: The troop being in line, the captain commands or signals, "*As skirmishers, guide left (right or center), MARCH.*" The chief of the left platoon commands, *As skirmishers, guide left.* The chiefs of the other platoons command, *Fours right.* At the command, MARCH, repeated by the chiefs, the left platoon deploys. The left trooper marches at a walk straight to the front; the other troopers oblique to the right at the walk, each taking the direction and gait of the left trooper when at his interval from the trooper on

his left and when on the alignment. The left platoon advances thirty yards, when the chief commands, *Platoon, HALT*. The other platoons move in column of fours to the right, and when the rear of each platoon is opposite its place on the deployed line, the chief commands, *Fours left, MARCH*. As skirmishers, *guide left, MARCH*. The left skirmisher of each platoon moves in such a direction as to leave his interval from the right skirmisher of the preceding platoon on reaching the line.

If the command of the captain be *Guide center*, the center platoon and the platoons to the right of the center deploy as just explained. The platoons to the left of the center wheel by fours to the left, and on arriving opposite their places in line, wheel by fours to the right and deploy on their right skirmishers.

If the command of the captain be *Trot*, the base platoon deploys as just explained, the base trooper moving at a walk, the other troopers of the base platoon deploying at the gait indicated. The other platoons are conducted at a trot to opposite their places in line, and there deployed in the same manner as explained for the base troop. Deployments will be made at a walk or trot, never at a gallop.

Skirmishers always deploy at the gait indicated, the base trooper moving at a walk, whatever the previous gait. *This rule is general.*

In extended order deployments, the command, *Guide left (right or center)*, designates the direction of the base, and should always be given before the command, *MARCH*. *This rule is general.*

In all deployments, whatever the gait, the base platoon is halted by its chief after advancing thirty yards, or on a line previously designated by the captain. If it is afterwards desired to move the deployed line forward, before it is formed entirely, the captain will command, *Forward, MARCH*. The platoons in rear of the line, as soon as they are deployed, will then be conducted by the chiefs, at an increased gait, to their positions on the deployed line. The captain may also halt the base platoon before advancing thirty yards. *This rule is general.*

Being in line to form line of platoons, the captain commands: *Line of platoons, guide left (right or center), MARCH*. Executed at a walk, the platoons gaining deploying distance on the base platoon and halting on the line faced to the front. The principles of paragraph 8 apply.

Being in line of platoons to form line of skirmishers, the captain commands: *As skirmishers, guide right (or left), MARCH*. The chiefs repeat the commands. The platoons deploy on the right skirmisher. Each platoon is halted when it has advanced thirty yards.

Being in column of fours to form line of platoons to the front: *Line of platoons, guide right, MARCH.* The chief of the first platoon commands, *Left front into line, TROT.* The chiefs of the other platoons command, *Column half left.* At the command, *MARCH,* repeated by the chiefs, the first platoon forms line and is conducted forward thirty yards and halted. Each of the other platoons is conducted to a point opposite its place in line and thirty yards from the line, changes direction half right, executes left front into line, trot, march, and is halted on the line.

Troop in column of fours to deploy as skirmishers to the front: *As skirmishers, guide right (or left), MARCH.* The chief of the first platoon repeats the command. The other chiefs command, *Column half left, MARCH.* The first platoon deploys, as explained for the deployment from line. The other platoons are conducted opposite to their places and deployed in the same manner. The troop in column of fours forms line of platoons or skirmishers to the right by wheeling by fours to the right, and afterwards deploying as from line.

To assemble (from line of skirmishers): *Assemble, guide right (left or center), MARCH.* Each chief of platoon commands, *Assemble, guide right (or left), MARCH,* the command being *Guide right (or left),* according as the platoon is to the left or right of the base trooper of the troop. Each platoon assembles on its base trooper and is then conducted in column of fours to its place in line.

Squadron in line to form line of platoons: *Line of platoons, guide right (left or center), MARCH.* The base troop forms line of platoons. Each of the other troops is marched in column of fours opposite to its place in line, wheeled into line and deployed into line of platoons from the base platoon.

Line of skirmishers is formed in a similar manner, the command of the major being, *As skirmishers, guide right (left or center), MARCH.*

Squadron in column of fours to form line of platoons to the front: *Line of platoons, guide right (or left), MARCH.* Captain of first troop commands, *Line of platoons, guide right, MARCH.* The captains of other troops command: *Column half left, MARCH. Column half right, MARCH. Line of platoons, guide right, MARCH.*

Line of skirmishers is formed in a similar manner, the major commanding: *As skirmishers, guide right (or left), MARCH.*

To dismount to form on foot: The troop being in column of fours, the captain takes post on either flank and commands: 1. *Form on foot, 2. DISMOUNT.* At the second command, Nos. 1, 2 and 3 of each four dismount, link horses, and move out of the column on the side toward the captain. Each platoon then closes up in column of

fours on its leading four, the leading four facing to the front, the inner man being one yard from the horses of that four. The chief of platoon, dismounted, takes his post, as in column of fours, on the side towards the captain.

To deploy to the front, the captain commands: *As skirmishers (or line of platoons), guide right (or left), MARCH.*

To deploy to the right (or left): *Fours right (or left), MARCH. As skirmishers (or line of platoons), guide right (left or center), MARCH.*

To assemble in front of the horses: *Assemble, guide right (or left), MARCH.* The first platoon, at the command of its chief, is formed left front into line, on a line five yards in front of the horses. Each of the other platoons is conducted in column of fours to its place in line, and when near the line, is formed left front into line in prolongation of the line of the first platoon.

To assemble to the right (or left): *Fours right, MARCH. Troop, HALT. Assemble, guide right (left or center), MARCH.* The base platoon is moved forward five yards and halted. The other platoons are wheeled by fours toward the base platoon and formed in line on its left (or right).

THE SQUADRON.

When the squadron is dismounted to form on foot, the captains place themselves on the flank toward the major.

Being in column of fours to dismount and deploy to the front, or to the right (or left), the movement is executed by the same commands and like means as in the case of a troop.

The squadron being in line of troops in columns of fours, to deploy to the front: *Form on foot, DISMOUNT. Troops assemble, guide right (or left), MARCH. As skirmishers (or line of platoons), guide right (left or center), MARCH.* The troops are assembled in front of the horses and there deployed.

It often happens that the command "to fight on foot" is inapplicable; the expression, "Form on foot," has therefore been substituted. Occasions often arise when it is necessary to dismount, leaving the horse holders mounted, in order to clear away obstacles, mend roads, extricate wagons, etc. To dismount a funeral escort in order to fire a salute by the command "to fight on foot," is ridiculous. This command implies immediate hostilities, and occasions might arise when fighting should be avoided, and when it would be inconvenient and dangerous to peace to use this form of command. "Form on foot" has not this objection.

It will be noticed that all the commands laid down can be sounded on the trumpet except one. This exception is the command, "*Form*

on foot, DISMOUNT." It is suggested that the signal to be found in the artillery drill regulations, of "*Cannoneers, prepare to dismount, DISMOUNT,*" would be suitable for this command.

The above is a rough sketch of a system of deployment. The following advantages are claimed for this system:

Greater simplicity of command.

Greater simplicity of execution.

The size of the fire unit more closely corresponds to the most suitable size, as fixed upon by writers on the Art of War.

The fire unit is a more convenient division of a cavalry troop.

Freedom from the confusing distinction between the administrative squad and the drill squad.

Group leading is made the rule during, as well as after the deployment, thus better maintaining the integrity of the group, and the authority of the group leaders.

The confiding of the command of groups to the most experienced instead of the most inexperienced leaders.

The extension of the use of the trumpet or other signal to all commands for deployment.

In considering this subject we must not fail to keep in mind that the training comprised under the caption "Extended Order" in our drill book is not only of a most important nature, since it fits the soldier for battle, but also is most extensive, including a mass of subjects to make the soldier familiar with which requires long and patient training. Fire discipline, instruction on varied ground, use of cover, and battle exercises, are some of the subjects included in extended order, and in comparison with which the question of deployment is of small account.

We, of the cavalry, are already greatly weighed down by the immense variety and extent of the training necessary to make our short service men even fair soldiers, as that term is understood in modern warfare. Hence, we cannot afford to spend valuable time teaching complicated methods of forming a line of groups, or of skirmishers, many of which would be of doubtful utility on the battlefield. Precise and varied maneuvers are a great help to discipline, but the place for teaching that sort of thing is at close order drill.

Let it be understood, then, that the training of the cavalry soldier to fight dismounted is of vast importance; that the method of deployment is of little consequence, provided it is simple, easily learned, and effective. Such a method we do not possess, and should adopt.

THE NEW MODEL MAGAZINE RIFLE, CAL. 30.

[The following description of the new magazine rifle, adopted for use in the U. S. Army, which is practically, as regards its mechanism, the same as the carbine to be made for the cavalry, is that prepared for the use of the cadets at the Military Academy at West Point, and has been furnished to the JOURNAL through the courtesy of Lieutenant JOHN M. CARSON, Jr., Fifth Cavalry, Adjutant of the Academy. The plates were made from drawings by Captain STANHOPE E. BLUNT, Ordnance Department, U. S. Army.—EDITOR OF JOURNAL.]

THIS gun was adopted for the U. S. Service in 1892, and is now being manufactured for issue. It is called also the Krag-Jorgensen, from its inventors, and resembles in many respects the Danish small arm, but has many improvements not found in the latter.

GENERAL FEATURES.

In its general features it is a bolt gun with fixed magazine, and cut-off so arranged that the piece can be used ordinarily and readily as a single loader, and the magazine can be brought into use at any moment. The magazine can be loaded with the breech closed or open, and the cartridges can be placed in singly or all at once. The magazine carries five cartridges.

DESCRIPTION.

Breech Mechanism.—Bolt.—The bolt *d* Figure 6, is a cylinder of steel bored out axially to receive the firing pin and main spring (*v* and *e* Figure 2). On its exterior are three projections, the locking lug *k*, which fits in a corresponding groove in the front of the receiver, the guide rib *r*, and the handle *h* for operating the bolt. A groove on the under side forms a path for the rear of the ejector. A triangular slot is cut in the rear of the bolt under the handle.

One of the sides of the notch thus formed is inclined to the axis of the bolt and forms a bearing for a similarly inclined surface on the cocking piece *m*—Figure 11.

Firing Pin.—This consists of two parts, the striker Figure 8, and the pin proper Figure 7.

Cocking Piece.—On the rear of the firing pin is screwed the cock-

ing piece Figure 11. The forward end of this is cut away at an angle, making an inclined surface *m* which bears against the inclined notch in rear end of bolt. *n* is the cocking notch.

Sleeve.—The firing pin and bolt are connected by means of the sleeve Figure 12. This sleeve, though a single piece, may be considered as composed of two parts.

1st, *e*, which projects over the top of the rear of the bolt and to which is attached the extractor in the notch *a*.

2d, *d*, a hollow cylinder which enters the hollow in the rear of that bolt and through which the firing pin passes. In the recess *w* works the collar *b* Figure 6, which connects the bolt and sleeve and permits the rotation of the bolt without rotating the sleeve.

If the bolt be rotated far enough, which may be done when it is out of the receiver, the sleeve may be removed.

Safety Lock.—Lying in the top piece of the sleeve *e* Figure 12, is the safety lock Figure 13. It consists of a short rod *a* with a thumb-piece *d*. The end *a* if cylindrical would always project into the cavity *w* Figure 12; it is therefore half cut away. When the latch is turned to the right, the part not cut away projects into the cavity *w* and enters a notch in the rear end of the bolt (*a* Figure 6), and prevents rotation of the bolt. The thumb-piece is slightly cut out on left side (in Figure 13), to allow the passage of the cocking piece Figure 11. When the thumb-piece is turned the solid portion comes in front of the cocking piece and prevents its forward motion, and hence the piece cannot be fired.

Mainspring.—This is a spiral spring surrounding the firing pin and bearing in front against the striker at *v* Figure 1, and in rear against the forward shoulder of the sleeve.

Extractor, Figure 14.—This is a long spring of steel attached to the front end of the sleeve at *o* Figure 1. It has a projection on its under side, which bearing against the shoulder *s* of the guide rib *r* Figure 6, prevents rotation of the bolt. When the bolt is withdrawn, it can be released from the shoulder *s*, the bolt may then be further rotated to the left and entirely withdrawn from the receiver.

Ejector.—This is a double lever *p q* in Figure 1, pivoted at *v*. The arm *p* ordinarily lies in the groove in the bottom of the bolt.

The end *q* then lies flush with the bottom of the receiver. When *p* reaches the end of its groove in the bolt, it is suddenly forced down which raises *q* (as in Figure 1), and ejects the cartridge.

The Magazine, Figures 19 to 25.—This is a box lying horizontally under the receiver and coming up on the left side, where it has its entrance to the receiver.

MODEL 1892.

(UNITED STATES)

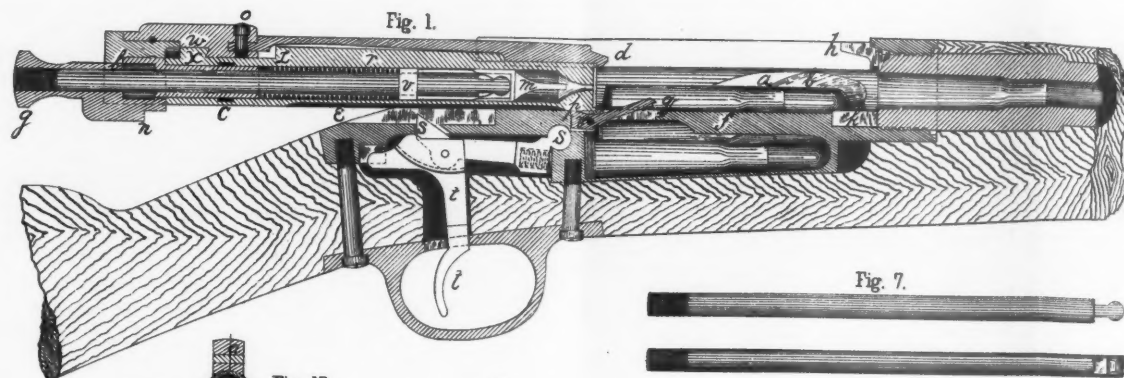


Fig. 1.

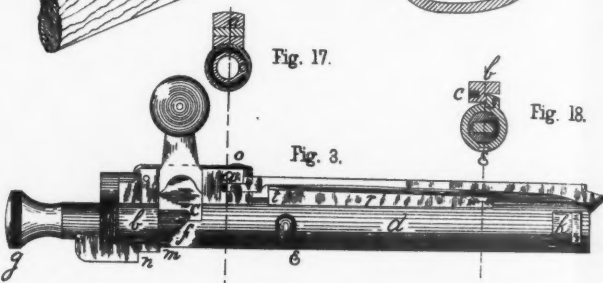


Fig. 17.

Fig. 3.

Fig. 18.



Fig. 11.

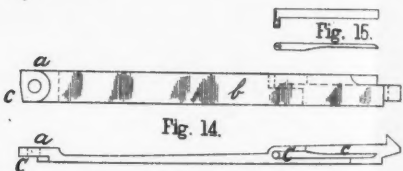


Fig. 14.



Fig. 16.

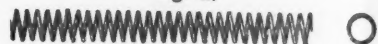


Fig. 15.



Fig. 12.



Fig. 13.

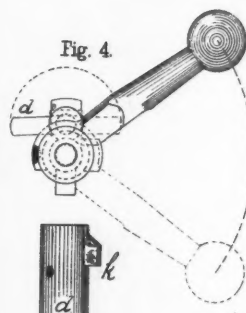


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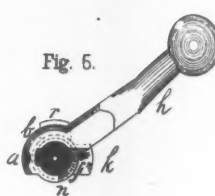


Fig. 5.



Fig. 8.



Fig. 9.



Fig. 10.

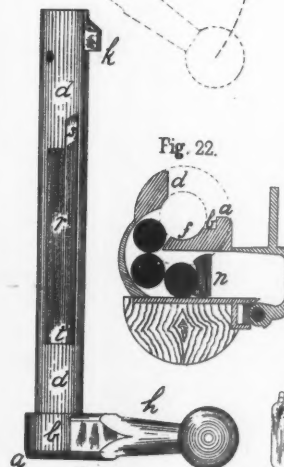


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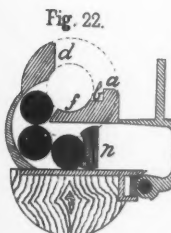


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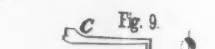


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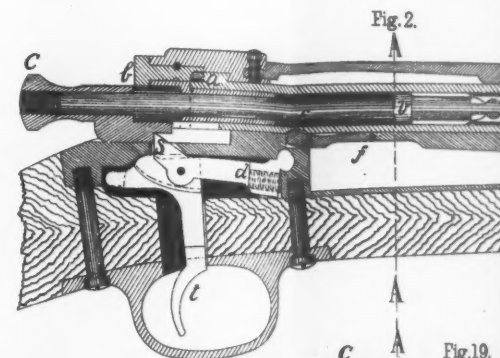


Fig. 2.

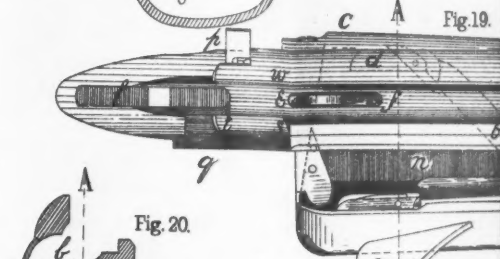


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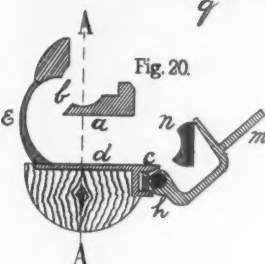


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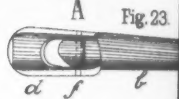


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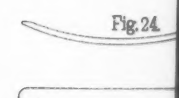


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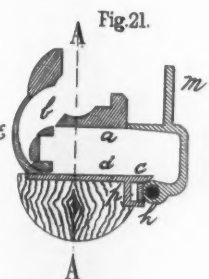


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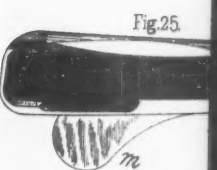


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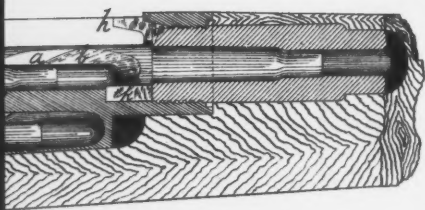


Fig. 7.

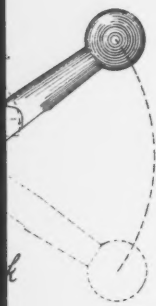


Fig. 5.

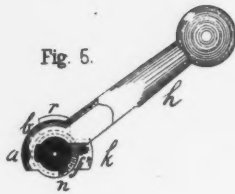


Fig. 8.



Fig. 20.

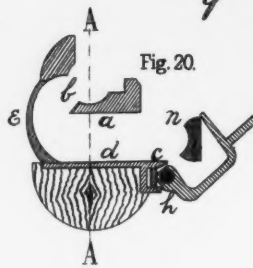


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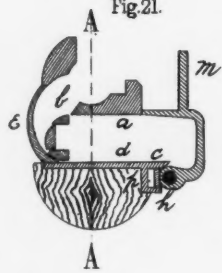


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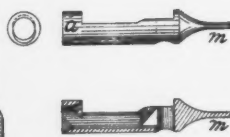
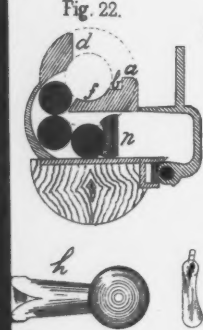
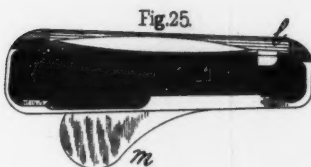
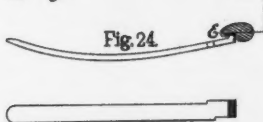
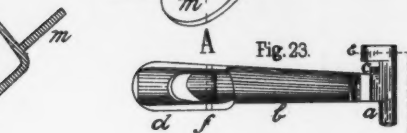
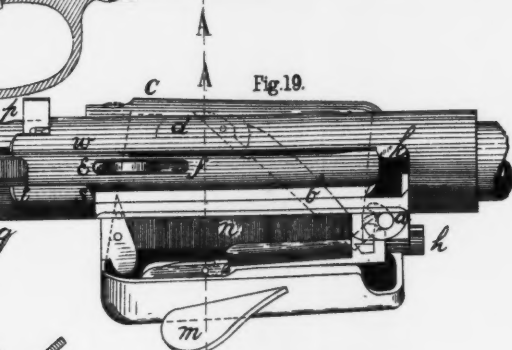
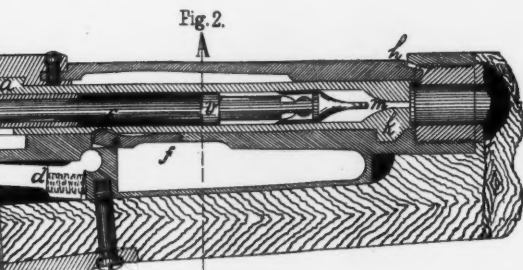


Fig. 9.



Fig. 10.

9



The Gate, Figure 25.—Is on the right side, and may be rotated about the hinge *h* Figure 20, by pressure on the thumb-piece *m*.

The Carrier, Figure 23, rotates about the axis *a* and carries on its forward end the follower *d*, which pushes the cartridges into the receiver. It receives its motion from a flat spring (Figure 24 and *c* Figures 20 and 21) bearing against the shoulder *e* Figures 23 and 24.

The carrier is withdrawn from the magazine and into the gate to permit the insertion of cartridges, by the lug *b* (Figure 25) on the gate bearing against the surface *c*, of the carrier Figure 23, when the gate is opened.

The Cut Off, Figure 10, consists of the thumb-piece *p* and the shaft *b*, *a*. This shaft is half cut away at *a*. The portion *a* of the shaft lies in the top of the magazine and parallel to its axis. When the magazine is in use the plane surface of *a* coincides with the sides of the magazine.

By turning the shaft about 90° the curved portion of *a* projects into the magazine and bears down the top cartridge far enough to permit the bolt to pass, without touching the cartridge.

Operation.—The piece having been fired, to load,—Turn the handle to the left till the locking mass *k* is disengaged from its groove in the receiver. An inclined surface, in the rear of the receiver bearing against the handle forces the bolt slightly to the rear unseating the cartridge case.

At the same time the cocking piece is forced to the rear by the inclined surface on the bolt bearing on the surface (*m* Fig. 11), on the front of the cocking piece, withdrawing the bolt.

The cartridge is extracted by the extractor. At the end of the motion, the point *p* of the ejector reaching the end of its groove is forced down raising *q* which strikes the under side of the case and ejects it. A cartridge may now be dropped into the receiver, or, if the magazine be in use, the head of the upper cartridge will be in front of the bolt. Pushing the bolt forward forces the cartridge into the chamber. The final rotation of the handle to the right seats the cartridge by the slight forward movement of the bolt due to the action of the inclined surfaces of the receiver, locks the bolt, and completes the cocking since the cocking notch bears against the nose of the sear before the rotation commences.

MILITARY FOOD.

BY CAPTAIN CHAS. E. WOODRUFF, ASSISTANT SURGEON, U. S. ARMY.

PRINCIPLES OF THE SELECTION OF THE RATION.

A survey of the principles that have brought this ration to its present condition will greatly aid us in correcting its evils in the future.

In the first place, economy is always kept in mind. War is so expensive that the feeding of soldiers on anything except the cheapest foods obtainable would cause an effectual outcry from the statesmen who secure the funds for carrying on the war.

Second, and to some extent a corollary of the first, is the principle that the food must be a product of the country at large, neither a specially prepared article nor the output of a few manufacturers. This makes the ration consist of articles that are available in war. The army must be independent of local resources.

Third, the articles must be easily preserved in all climates by the most ignorant men.

Fourth, the articles must be easily transported, and capable of the roughest handling during transit.

Fifth, the ration is intended for the strongest and most robust men in the nation, and it is acknowledged that the sickly would be killed.

Sixth, it must approximate to the food used by the nation at large, so that there will be no rapid change of diet on enlistment that would impair the health.

For these reasons the soldier's ration has always been simple and dry. Indeed, until quite recently, there has been but little change in the ration for seventy-five years. During the Revolution the soldiers fared quite badly, though the law gave them quite a liberal ration. In 1785, after the war, it was one pound of beef, one

pound of bread, and one gill of rum. The beef was increased to one and one-fourth pounds in 1798, and the bread or flour to eighteen ounces at the same time, at which they have since remained, except for three years during the Rebellion, when the bread or flour was increased by four ounces. At this time also (1861-1864) one pound of potatoes was issued three times a week. From time to time other changes and slight additions were made; in 1818 some dried vegetables (peas, etc.) were added; in 1832 a small amount of coffee and sugar was issued in lieu of spirits, and there have been numerous changes in salt, pepper and vinegar. The coffee and sugar have remained unaltered for thirty-two years. At the present time the garrison ration is more liberal than it has ever been before.

Now these principles must be partly changed in the future. There is not the least doubt about it, as a little discussion will make evident. In the first place, we have known for ages that war means epidemics of disease. Armies have thus been wiped out of existence, or so fearfully reduced that retreat was necessary. Military blunders have had their share in producing these deplorable results, and so has bad sanitation, and so has bad food; perhaps the latter has been the chief fault in many cases. The military blunders have not been repeated, and the sanitation has been greatly improved, so that modern wars show a vast improvement. At a medical congress in Philadelphia during the Centennial, the German delegates were inclined to boast of the phenomenal smallness of their deaths from preventable disease during the Franco-Prussian War. Indeed I have been informed that they were inclined to sneer at the fearful results of our own war, and indirectly accused us of gross ignorance. Though they were undoubtedly correct in the main, it has been remarked that if their war had been half as long as ours the results would have been just as bad. I can scarcely agree with this criticism, because in our war the most fearful and fatal sanitary errors were made in the beginning, while the Franco-Prussian War was not as long as even the beginning of ours.

In this war the Germans were the first to change some of the above principles governing the selection of the ration, and to do it successfully.

1. As for economy, it does seem strange that economy should be insisted on in this one matter of food, when we are aware that the defects and insufficiencies caused by economy may be to blame for so much disease and suffering. Then it is known that a short-sighted economy is the worst form of extravagance. If by a very liberal ration we can succeed in preventing sickness and death, the

saving in pensions alone will be enormous. If the ration costs thirteen cents as was once boasted by an army officer in favor of economy, a little calculation will show that the cost of feeding an army of 1,000,000 men in a four years' war is just about what our national pension bill will be for the next fiscal year.

The absurdity of urging economy in warfare can best be illustrated by that English military genius, who is said to have strenuously objected to the proposed manufacture of big guns, because a single shot would cost at least ten shillings. He little imagined that ten discharges of the large modern gun would cost more for ammunition than a whole engagement such as that famous one of the "Constitution" and "Guerriere."

As the present ration costs less than fifteen cents it is rather far fetched to talk of extravagance. There are few healthy laborers in respectable standing in civil life who subsist on less than one dollar a week.

The Germans obtain economy in their immense army by inculcating the idea that military service is a patriotic idea, and that the young man must make sacrifices for the common weal. It is said that he is expected to piece out his poor diet by the things sent from home. This is possible, as he never serves far from his home. We must look then with considerable suspicion on the small German peace ration remembering that the United States soldier cannot get extras from home. The French and English soldiers actually do contribute from their pay to the increase of their table fare.

In the future, it is to be hoped, that though a reasonable economy should always be kept in mind, it should *not* be the *guiding* principle in feeding the soldier. War is so expensive, always has been so, and is getting more and more expensive with every improvement of ordnance and means of transportation. To-day its expense far exceeds the wildest flights of the imagination of the last generation of military men, and we can reason by analogy that the war of fifty years hence will be proportionately worse.

2. It is true, only to a limited extent, that the articles of the ration must be the product of the country at large. Of course everyone understands that our country is so large and varied in climate, that there are but few articles of diet that can be efficiently grown throughout the whole length and breadth of the land. Considering the latitude, or rather the temperature, of the whole country, it is a general rule that a man thrives best when his chief diet consists of the articles grown in his own district. For instance, he must have the animal fats in the north, but he must have rice and the fruits in

the south, and must not be fed on articles grown throughout the land. In cases of invasion of the country, the army might be concentrated on one frontier, and the special articles there raised might not be sufficient in amount, so that the whole country would have to be drawn on for supplies. In this limited sense the rule will have to stand for all time to come.

3. The rule that articles must be easily preserved in all climates, though formerly of importance, is becoming less and less so as years go by. The methods of preserving food are becoming so exact, that it is now possible to keep articles in good condition for months, or even years at a time, where it was not formerly possible to keep them a day. By means of the wonderful advances in the business of cold storage, refrigerator cars, portable ice machines, and drying appliances, the commissary department, in future wars, will be found supplying the army with fresh articles, now entirely out of the question.

There is another point to which a mere reference is necessary. In cold climates, no article can be used in the field in winter that would be spoiled by freezing, or by alternate freezing and thawing. This blocks out a few articles put up in glass in fluid preservative, potatoes and all fresh vegetables, and fruits and various other articles.

The thought is now being evolved that it is not always necessary to have a ration that will keep in all climates, more than it is to have a uniform that can be worn in all climates, whether 50° below zero or 120° above. As the food might be purchased within the climatic district in which it is used, the ration in the extreme north can be of such a nature that it might spoil in the extreme south, or *vice versa*. If such a radical idea ever becomes practicable, it will greatly facilitate the process of making the ration flexible. A few years ago it was thought that the soldier of the southern summer must eat the same kind of fat pork, etc., that was used in the northern winter, but at present it is recognized that there must be a distinction, and as time goes on there is a greater and greater tendency shown to adapt the food to the place and circumstances. The addition to the ration of fresh vegetables, in 1890, has been one of the greatest advances made since 1818, when dried vegetables were added in lieu of some of the old issues, and various other substitutions permitted. The occasional issue of dried or fresh fruits of the cheaper and more easily preserved varieties, would be a boon highly appreciated by the troops in the hot districts of the South.

If two ships were to start from New York, each to be absent several years, one in the Arctic Regions and the other in the Tropics,

no one would even dream of provisioning them alike. Yet, if two armies were similarly to start from New York for long periods, one to the extreme North and the other to the hottest parts of the South, the law presumes that both shall carry essentially the same rations. We have not reached the point where it is decidedly recognized that the variety in the ration must be great enough to permit of sufficient flexibility to suit extremes of climate.

4. As to the rule that the article must stand the rough handling made necessary by the conditions of field service, it can be assumed that such a rule must always stand. It could be affected by the one remote and apparently absurd condition that improved methods of constructing roads will make such strides that the army can be followed by new railroads and supplies unloaded every night at each company street.

5. It is in reference to the assumed condition that the food is intended for only the strongest and most robust men, that there is an oversight in times of peace.

Until quite recently it was presumed that if the ration kept the soldier alive it was sufficient. The idea that it should keep him in health is modern, and logically follows both from increased knowledge of the etiology of faulty food in the production of disease, and from a contemplation of disastrous epidemics on land and sea, following upon a long continued improper food. The smallest amount of food that will keep a man alive has been approximately known for centuries, and though modern experiments make our knowledge vastly more detailed, accurate and scientific, they have added little to the knowledge that one pound of bread and one and one-fourth pound of meat daily will subsist a man for quite a long period. When we come to discuss the amount and kind of food necessary to keep him in health, we are on debatable ground. Our knowledge on this subject is not yet complete enough; we have only the theories and opinions. A man may appear to be healthy, but it is not quite certain that he may, on the one hand, be taking too much of one variety of food, generating a tendency to plethora or lithæmia, or on the other hand, living in a constant tendency to anæmia or scorbutus, with all the liability to contract other diseases from lessened general vitality and resisting powers. We all know men whose usual daily food is even more simple than the ration, but we know also that there are times, as during occasional visits from home, when they eat other things that perhaps restore the balance. Patients have often been restored to health by a change of diet made necessary by a recommended change of scene.

The military renaissance which is afflicting our army is still in the acute stage, and one of its symptoms is the desire to produce an ideal soldier. The error consists in assuming an ideal that is too high. It is away and beyond what the available material will ever permit. Both mentally and physically, the average soldier is not capable of that high individualization which is desirable in modern warfare.

In times of peace, perfectly reliable men of much intelligence and some education want more than \$13.00 a month and board; indeed, the average mental development of human beings is far less than people generally think. THOMAS CARLYLE wrote in reference to the English nation, that it consisted of so many millions of people—mostly fools. After deducting enough accounted for by CARLYLE's dyspepsia, there still remains a grain of truth. Common sense is said to be uncommon sense. Men in the lower walks of life, though apparently wide awake, are apt to have a remarkable deficiency of intelligence; indeed, men who are virtually imbeciles have gone through life in some laborious employment requiring no intelligence, and their defects have never been discovered. In times of war the average intelligence will be far in advance of what it is now, for then the volunteers coming from all walks of life will raise the standard near to our ideal soldier. There is considerable discrepancy in the claims of military men as to the actual grade of intelligence necessary in the ideal soldier. While some demand men of high average intelligence, others confidently affirm that excellent soldiers are made of men of very low average mental power—Indians and Negroes.

The greatest error, and that which concerns us here, may be found in the idea which assumes the physical development of the soldier to be so much higher than it can ever be. We all know about what the ideal should be. A medical officer who has devoted very much time to this subject, arranged a table of measurements of leg, arm, chest, abdomen, height, weight, etc., compiled from a vast number of observations. He probably took the averages. Anyhow, he sent this table to various recruiting officers, and without exception they returned it, with the remark that the men were not to be found. It is like the artist's ideal, which is never found, and one model is chosen for his arms, another for his chest, another for his legs, and so on. What it is wished to emphasize is the fact that man's average physical development is very poor, even in times of peace. It is getting poorer with every invention of labor saving machines, except where special gymnastic training is indulged in.

In war times it will be even worse, and exercises and drills now required cannot be enforced, because the men will be physically unable to perform them. For illustration of this point I have copied from Dr. GREENLEAF's article on examination of recruits, the following diseases and deformities for which we invariably reject a candidate for first enlistment, but which in war times constitute no bar to compulsory military service. It will be noticed what a miserable lot of recruits might possibly fall to one's lot, miserable I mean, from our present peace standard:

Milder form of skin diseases.

Parasites—lice, itch.

Ulcers—showing probability of cure.

Baldness.

Slight curvature of spine.

Deafness of one ear.

Loss of sight in one eye or loss of one eye, and various defects of eye and vision.

Various defects of nose and nasal cavities.

Loss of teeth, hare lip, enlarged tonsils.

Goitre and wry neck in some forms.

Hæmorrhoids and hernia—milder forms.

Gonorrhœa and other venereal diseases. Loss of testicles and various malformations of genital organs.

Various deformities of bones and of arms and legs, congenital or the result of diseases.

Loss or deformities of various non-essential fingers.

Varicose veins, flat-foot, knock-knee and various minor defects of toes and feet, all of minor forms.

Indeed the rule is somewhat similar to that in times of peace for the discharge from the army of a man already enlisted. That is it must be conclusively shown that the man cannot do duty, even if he has a defect or disease that should have caused his rejection. During the conscription it is even more stringent, and men are taken even when it is shown that they are incapable of all duty in the fighting line. Such men are expected to serve as clerks, messengers and at other light duty. The company officers in the next war may find that they have soldiers who as a class are physically not only far below that ideal standard which we are now building up, but who are even below the average now obtaining.

This defective physique is possibly one of the reasons why war is so disastrous to life from the diseases incident to camp life. The men have too little vitality to resist the inroads of disease, and what

vitality they have is still further reduced by privations, hardships and exposures. Such conditions harden and strengthen men of great vitality but kill the others. The War of the Rebellion cost about 300,000 lives, of which only about one-seventh, or 44,000, were killed in battle, about one-sixth died as a result of wounds and accidents, while more than three-fifths, or 184,000, died of disease. Not having statistics at hand to verify statements regarding other wars, I can only state that to the best of my recollection, in some of the wars of the last 100 or 200 years, as high as nine-tenths of the deaths were due to disease. It is impossible to state what proportion of fault lay in the defective physique, what in unsanitary surroundings, what in exposure and what in bad food, but all were causes.

The worst feature of all this matter lies in the fact that armies usually consist of very young men, many of whom are mere boys. Their whole physical organization is so elastic that they bend, not break, under these hardships. Though they apparently recover their usual health when the war is over, permanent damage has been done, and shows itself in premature old age. This country is full of veterans who are old men at fifty.

It is a fundamental principle of physiology that the slightest loss of health due to privations and hardships makes a man less able to withstand future hardships. The old idea that a soldier must be lean, lank, bronzed, half starved, and toughened by hardships is becoming worn out. Such a result is no doubt quite desirable, and an army of such men will accomplish wonders, but it kills too many men in the process of obtaining it. Apropos of this, a military writer gives as a maxim of war that "it is a matter of only ordinary prudence for a general to avoid exposing his troops to needless privations and unnecessary hardships, lest in time of necessity they fail to meet the crisis."

A new rule as to the ration can therefore be unhesitatingly announced, that in future wars it should be liberal enough to assist in building up the defective and weakly men that it will be necessary to accept. This rule is entirely opposed to the present one whereby the food is assumed to be bad, and in peace every man is rejected who would be injured by eating it. This is not mere fancy. It is a rule for instance to reject men who have deficient teeth, because men have been known to break down on Indian campaigns because they could not masticate the hard food supplied.

AVAILABLE SOLDIERS OF NATION.

This matter can be reduced to an absurdity by showing how few men in the nation come up to the ideal standard. A recent report of the Adjutant-General shows that of all the candidates for enlistment examined in the previous year, seventy-four per cent. were rejected on the ground of moral, mental or physical disability. The last census shows that there are about 7,000,000 citizens between the ages of eighteen and thirty. If only one-quarter of these are to be taken, it gives the nation only 1,800,000 available soldiers. Now it is possible to form only a very rough estimate of the number of these young men who possess those high physical and mental qualifications that go to make up a soldier of great endurance and ability. It can be safely put down at less than 1,000,000. It might be objected that a large number of those who now apply for enlistment are from lower classes who are apt to have poor bodies and poor minds, and that in war the young men of higher walks of life will enlist. This latter class will be far healthier and may prove to have a smaller percentage of rejections, but this class will contain many men of sedentary habits and poor physique, so that it is quite possible that the proportion of rejections will be more than seventy-four per cent. Again, men between the ages of eighteen and twenty-three are not usually fully developed. They are mere boys and not able to stand the fatigue of war. NAPOLEON strongly objected to the habit of sending boys to his army, as they served only to litter the roads with exhausted soldiers.

It can then be safely estimated that if the country is scoured from end to end, not three-fourths of a million young men will be found to possess the qualifications of the ideal soldier. If a great war occurs, it will be impossible to raise the necessary force of 250,000 men without taking men of greater age and of much poorer physique than we now consider the ideal. There are 13,000,000 citizens of militia age—18 to 44, inclusive—and it is said that of these 9,000,000 are fit for military duty of some sort. This great number shows conclusively that the soldier in war is not to have a very high physical development.

INJURIES OF BATTLE.

Various other conditions point to the necessity of having a liberal war ration. After a battle the wounded are looked after as quickly and efficiently as the force of surgeons and their equipment will permit. It is a time of great hurry and confusion, and it is quite

evident that the surgery is done under exceedingly great inconveniences. Notwithstanding all the care and forethought given to this subject, each war teaches a lesson in regard to these wounded. There is a fearful mortality. Wounds that ordinarily heal kindly and rapidly, are apt to take on severe inflammation, suppuration or gangrene; the patients suffer from various forms of blood poisoning, and many die in a short time of wounds that in ordinary times are always followed by recovery. Many die of pure exhaustion, without any of the above accompaniments. This is a state of affairs that has existed from the earliest times, and has been described in medical books two or three thousand years old, and it is the same in the last great war of Europe. If the causes are known, it is inhuman not to make a vigorous effort to remove them.

The causes of this terrible suffering and mortality are found in the condition of the patient and his surroundings. He has been hard pushed for a more or less prolonged period, previous to battle. His food has been poor and scanty, and he is exhausted. He may be dirty in the extreme. He is crowded into temporary shelter with other wounded and becomes an easy prey to the germs of disease, which we now know are the causes of the complications mentioned. The recent advances in surgical science can be depended on to remedy much of the evil, but it is impossible to expect good results when the patients are already exhausted by the fatigues and privations supposed to be unavoidable just previous to battle. It is certain that if the men were strong and well fed, there would be a remarkable change for the better. It is, therefore, incumbent upon us to do all in our power to place them in such condition of health that recovery can be reasonably expected if they are wounded in battle.

Instead of the soldier entering an engagement lean and exhausted, from insufficient or improper food, he should be strong, hearty, well fed, and with an immense reserve of vitality that will rapidly carry him through a successful convalescence. It is a question of ordinary prudence, let alone humanity.

The sixth rule, as to the ration being similar to the national food, must always stand. The food which an Italian, or Turkish or Hindoo army would flourish on, might be utterly impossible to Americans, and this from differences of taste and habits. Human beings, by degrees, become accustomed to any diet, even though it be outrageous; they can subsist chiefly on fruits in the tropics, or chiefly on fats in the Arctic regions, but any rapid change of diet is disastrous. Now, as the militia when mustered into the service of the United States must subsist on the army ration, it is a cardinal

principle that the food supplied must closely approximate that to which they are accustomed. As regards the present ration in garrison, this is approximately so, but it has not always been the case. The Secretary of War (Mr. CALHOUN), in 1818, reported to Congress that the mortality during the Wars of the Revolution and 1812, from the change of a plentiful mode of living to that of the camp, "was probably greater than from the sword." As Americans live more liberally than Europeans in similar walks of life, we have at once an incontrovertible reason why the United States ration should be more liberal than that of any European army. The American laborer has meat every day, while the European laborer may have it but once a week, and the American soldier must and does have meat three times a day.

The garrison ration can occasionally be made so liberal that the sudden change to the roughest field ration is apt to produce harm for the above reasons. Complaints have been made on this very point in Indian campaigns in past years, when men have been suddenly called out. To be sure, they could be kept in a species of training when field service is expected, but as field service is apt to be at unexpected moments, we would have to be in continual training, and in that condition life is scarcely worth living. The only proper thing to do is to make the field ration approximate the garrison ration, so that the change of going from one to the other will be as small as possible.

The German army in peace is never without fresh beef and fresh bread; even during the summer maneuvers the contractors follow the troops and make deliveries of food. Field bakeries are established on the railroad nearest to the troops, and each company sends its wagon every one or two days for bread. This is possible in such a thickly settled country.

There is one side thought that is the legitimate outcome of this rule. Nature gave every animal on earth a pleasure in eating, and it is this pleasure which keeps animals in existence. If man's healthy normal appetites are utterly ignored, he will suffer from those diseases, both bodily and mental, which are characteristic of those religious fanatics who try to obtain the favor of their gods by resisting the wholesome promptings of Nature. With too much attention to appetite the man degenerates into the glutton. There must be the golden medium, and it is not right to neglect the matter utterly, as has been the case with soldiers. Nor is it right to consider the soldier's stomach as nothing more than a machine for converting the energy of the food into work performed in marching,

drilling and fatigue duty—300 grains of nitrogen and 500 of carbon for ten hours of fatigue. The soldier's appetite and taste must be recognized, and the ration made palatable in the field.

The whole matter of this discussion can now be put into a nutshell, for it will be noticed that everything points to the one fact, that the ration in war must be *liberal and varied* in order to prevent disease, strengthen the men, and increase their contentment. By these means the army will give out its greatest amount of work, and not fail when the greatest support is needed.

It is well known that on rare occasions the soldier is called upon to perform the most laborious duties, under almost inconceivable exposures and hardships, and it can well be assumed that at such times his food should be liberal to the point of extravagance.

CHANGES IN RATION.

Now it may be asked, How is all this to be accomplished? Surely not by the old methods, for it can be assumed that intelligent men have been thinking on the subject for generations, and every reasonable idea tried. Indeed there has been a retrogression, for the present field ration is not nearly as good as that which General WASHINGTON ordered for his troops during the Revolution, although it is known that his soldiers at that time never received their regulation ration.

A great improvement can be made with old methods by recognizing that the ration must be flexible enough to suit extremes of climate, and be varied enough to prevent disease. The difficulty has always been with transportation and preservation. The proper food could never be carried. Changes in the ration will result from the recent wonderful improvement in the preservation and preparation of foods. The advances in preservation of food are due first, to our knowledge of the causes of decay of organic substances, and second, to improved mechanical contrivances for preventing such decay. It is now known that putrefaction is always the result of the growth of various kinds of microscopic plants called bacteria. Keep out the bacteria and decay is impossible. The body of an animal will lie on the ground where it died, until torn to pieces by winds, freezing weather and the other causes that break up rocks. Without bacteria a moderate amount of oxidation will go on just as in the case of rocks that are thus broken up, but it will be so slow that in a short time all the carbon and nitrogen of the air will be locked up in dead animals and plants, and life will cease. Hence preservation of food is merely preventing the growth of bacteria.

These microscopic plants, like any other live thing, require warmth, moisture and food. They cannot grow and flourish below 42° Fahrenheit nor above 110° . The best temperature for nearly all of them is that of the interior of the human body, 99° to 100° ; this is why putrefaction is so common in summer and absent in winter. Freezing, though it prevents their growth and kills a few, has no fatal effects whatever on the largest number of species. In the spring time they are as lively as ever, though they may have been subjected to a temperature below zero for several months. Frozen substances cannot decay, and there is no limit to the time in which food can thus be kept perfectly good and fresh. In 1799 some peasants in Siberia discovered projecting from an ice bank the body of a huge animal and the wolves had been eating the flesh which was still fresh. Scientists were soon informed of it and secured the bones, hair and the remainder of the tissues that had not been eaten, and it was found to be a mammoth that had been overtaken by storms in the last glacial period, buried by snow, killed, its body frozen and there it remained until the ice melted. Its skeleton and hide are now in one of the Russian museums. The last glacial period was somewhere over 8,000 or 10,000 years ago; geologists vary in their estimates; they used to say it was 300,000 years ago. Anyhow we thus see frozen meat kept fresh and fit for food for more than 8,000 years, possibly 25,000 years.

Though they do not grow well if the temperature is over 110° , bacteria are not killed with less than fifteen to sixty minutes' exposure to a temperature of 160° . Boiling for thirty minutes kills nearly all of them. Hence food put in cans boiled one-half hour to kill bacteria, then made air tight to exclude new ones, will keep indefinitely without decay, though it may become softened by the dissolving action of water present, and thus become undesirable as food.

As bacteria require moisture, we see why it is that putrefaction is impossible if there is absolute dryness, though it must not be understood that dryness, as ordinarily understood, kills them any more than it kills seed wheat or corn.

Some bacteria require oxygen, others will not grow unless oxygen is excluded, but by far the largest number of species will flourish whether oxygen is absent or present.

Finally, bacteria will not grow in the presence of substances strong solutions of which are poisonous. For this reason decay is impossible if the substance is saturated with salt, alcohol or vinegar, and we find food preserved in all these ways. If bacteria are kept out in the above ways, decay is impossible. There is a pathetic

poem which illustrates the above quite well, though, of course, the truth of the facts cannot be vouched for. A young miner at work was killed by an explosion of fire-damp, and the shaft in which he was working was hermetically sealed by falling rocks. The air was driven out by the gases from the coal and these prevented the growth of bacteria. His body could not dry because there could be no evaporation. Forty years afterwards the shaft was reopened, his body was discovered, and brought to the surface. He was not recognized, of course, and an old woman was sent for; she proved to be his sweetheart, who had remained unmarried. As the corpse had remained unchanged she recognized it at once, and she could not realize the length of time that had separated them. The pitiful lamentations of this old woman over the corpse of a young man, her betrothed husband, were the theme of the poem.

These principles of bacterial life are mentioned in detail, because on them depend the new methods of preserving military food, or at least new modifications of old methods. It has been customary for ages to preserve food by cold, drying, and killing bacteria by heat, though the method of drying was formerly the chief, if not the universal means. It must be kept in mind that the above facts about bacteria and decay have been discovered quite recently, some of them since the older officers now in the army have entered the service. The machinery used is of still more recent origin; indeed, the whole subject is so new that it is liable to upset all our old ideas on rations, preservation of food, and even certain details of the art of war itself.

[TO BE CONTINUED.]

PROFESSIONAL NOTES.

THE BUFORD MEMORIAL.

"Subscriptions to the BUFORD Memorial, to be erected at Gettysburg, are coming in rapidly. An immediate remittance is not essential, but an early transmittal to the treasurer of a subscription slip, filled in with the amount intended, will enable the Executive Committee to form an approximate estimate of the sum to be realized. The War Department has approved the application of the association for the four guns of TIDBALL's battery with which BUFORD opened the battle of Gettysburg, and they will be incorporated with the monument; two are at Governor's Island and two at Watervliet Arsenal. Meetings of the Executive Committee will be held at the Army Building on the second Monday of each month."—*Army and Navy Journal*.

"*THIS FIRST INSPIRATION OF A CAVALRY OFFICER AND A TRUE SOLDIER DECIDED IN EVERY RESPECT THE FATE OF THE CAMPAIGN. IT WAS BUFORD WHO SELECTED THE BATTLE-FIELD WHERE THE TWO ARMIES WERE ABOUT TO MEASURE THEIR STRENGTH.*"—COUNT OF PARIS, CIVIL WAR IN AMERICA.

LOSSES IN BREDOW'S CHARGE AT MARS-LA-TOUR AS GIVEN BY KAEHLER.

[The following statement will give a correct idea of the number of officers and men killed and wounded in BREDOW'S charge at Mars-la Tour. The German Official History gives the losses only in gross, so that it is impossible to learn from it just how many men were killed and wounded, and how many captured or missing, an important thing to know in studying the results of a cavalry charge like that in question.—EDITOR OF JOURNAL.]

Seventh Cuirassiers.—Of the remnants of the cuirassiers, three platoons were formed. After the third squadron (sent into Tronville Copse) and first platoon of first squadron (on relay duty) had rejoined, the regiment formed two squadrons of four platoons each, not exceeding 220 riders of all grades. Not counting those dispersed men, who turned up during the next few days, the losses of the regiment are as follows:

Killed	1 officer,	43 men,	33 horses.
Wounded	6 "	72 "	25 "
Missing	— "	83 "	203 "
	7 "	198 "	261 "

Sixteenth Uhlans.—Of the Sixteenth Uhlans there reassembled at the first moment at Flavigny, six officers and eighty men, two officers and fifteen men rejoined by way of Mars-la-Tour. After the squadron sent against the Tronville Copse and a few small detachments had rejoined, the regiment had in the ranks, in the evening, twelve officers and 210 men, not a few of whom were slightly wounded. Not counting those that rejoined, the losses are:

Killed	2	officers,	28	men,	172	horses.
Wounded.....	5	"	101	"	28	"
Missing.....	2	"	54	"	—	"
	9	"	183	"	200	"

The author gives the number of horses in BREDOW's charge at 805, and states that there were a few more than 600 left when the charge was spent, and that they were then charged by French cavalry as follows:

First and Ninth Dragoons	each, 300 = 600	horses.
Seventh and Tenth Cuirassiers.....	" 400 = 800	"
Fourth Chasseurs à Cheval.....	four squadrons = 400	"
Fifth	five squadrons = 500	"
Seventh and Twelfth Dragoons.....	each, 400 = 800	"
	3,100	"

CARL REICHMANN,
First Lieutenant Ninth U. S. Infantry.

The following letter from Captain FAIRMAN ROGERS, Philadelphia City Troop, is published for the information of the members of the Cavalry Association:

PARIS, January 14, 1894.

The Secretary U. S. Cavalry Association:

DEAR SIR:—Some years ago I said to the Secretary of the U. S. Cavalry Association that my collection of books on "Horsemanship," which is the largest in America, was accessible at my house at Newport to any officer who wished to see or to use it.

As I have given up my Newport residence, I have given the whole collection to the library of the University of Pennsylvania at Philadelphia, where it will be accessible to every one, and where I hope it may be useful to some one who is at any time writing on such subjects.

I have been collecting these books for many years, and I think that the collection is nearly exhaustive for English and French books, while including a large number in other languages. It is particularly rich in the oldest books on the subject.

You might think it worth while to notice the fact of its transfer to the University library in the JOURNAL, for the information of any officer who might wish to consult it.

It is much larger than the West Point collection was some years ago.

Yours respectfully,

FAIRMAN ROGERS.

SOME MECHANICAL ASSISTANTS TO CAVALRY INSTRUCTION.

It was my duty during the past winter to set up twenty-six recruits, one of whom came to the troop accompanied by a report that he had been brought before a board of officers at Jefferson Barracks,

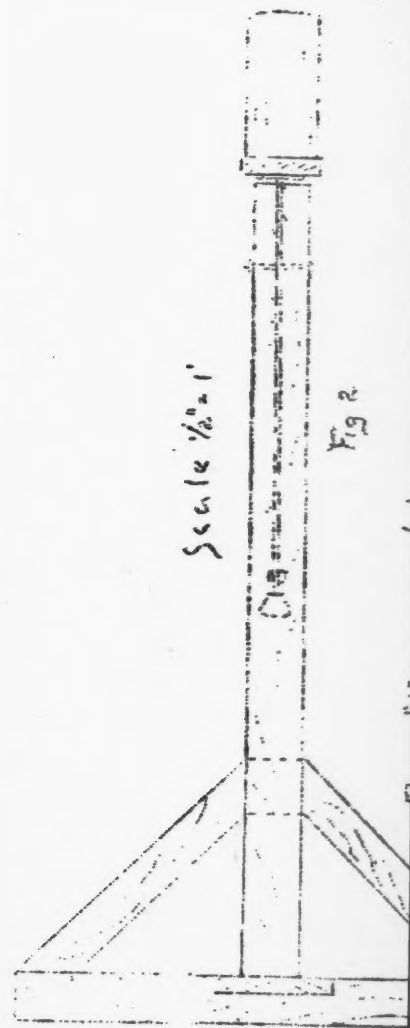
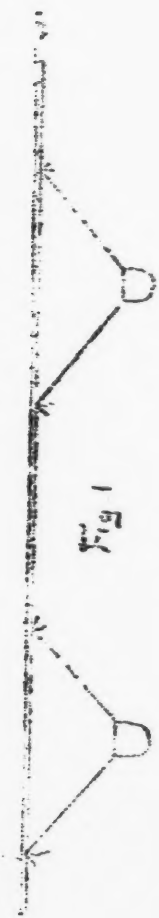
and found mentally incapable of performing the duties of a soldier, but was ordered held to service; consequently that weapon, the saber, of which we romance so much, and with which we practice so little, had to be put in his hands. It was impossible to teach this man in the ordinary way. Returning from drill one day I found hanging in a back room of my quarters a *D* ring. Drawing my saber I made a tierce point at it, and was surprised to find how easy it was to miss it. Suspending the ring in a doorway I got considerable exercise before I could make a successful tierce, right, left, and rear point.

The next day I stretched a lariat across the barracks, and tied *D* rings to it, as shown in Fig. 1. Placing a squad of old men in front of the line, at such distance that the saber would project through the ring about six inches when the arm was extended, I found that none of them could make a successful point. Recruits and old men were then put to work, with the information that as soon as a man could put his saber through the ring three out of five times at tierce, right, left, and rear point, he could drop out for that drill. Facing the rings, five trials were made with tierce point. A right face, left face, and about face, put the man in position for left, right, and rear point, respectively. Five trials were made with each point. Soon the results were very gratifying; at the command, "Point," eyes were fixed on the rings, and every saber went forward *at something*, and with a force that would have sent it through a man; interest was excited, and drill lost its humdrum. The recruit mentioned above, that could not understand the language of the Drill Regulations, understood "Put your saber through that ring." The major of the squadron, at the end of a week's practice, stated that the recruits were two weeks ahead in saber exercise of a detachment trained in the ordinary way.

This practice demonstrated that the usefulness of a weapon depends on the amount of proper practice a man has with it, and that just as good thrusting can be done with a curved saber as with a straight one, provided men are trained to it.

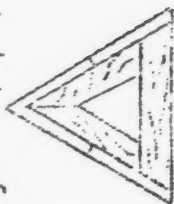
Cutting at heads with the ordinary head and post requires from one to two dismounted men at every post to replace the heads. In Fig. 2 an attempt has been made to get a head that will replace itself. The head is of leather, stuffed with hay, secured to a block by means of straps; the block is screwed to the bent top of an iron lever, the lever is placed in a slot in a 2x4 inch post and pivoted on a bolt, as shown. The bottom of the lever is bent to the front and a weight attached to it; two horseshoes were found to be heavy enough. On the back of the post (not shown in the cut) is screwed a strap of iron across the slot to prevent the head going too far down. The objection to this post is evident, it can be used only for cuts. Apparently the lever coming to the front is an objection, but it is not so in practice. It was found to work well for cuts; for points another separable head can be placed on top.

The prime requisites of a good hurdle are solidity and ease. It must be solid enough to prevent the horse thinking he can push it



Scale $\frac{1}{2}'' = 1'$

Section of H.B.



Section of C.D.

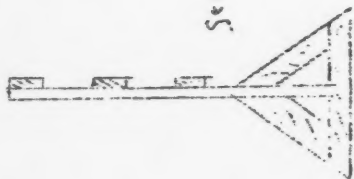
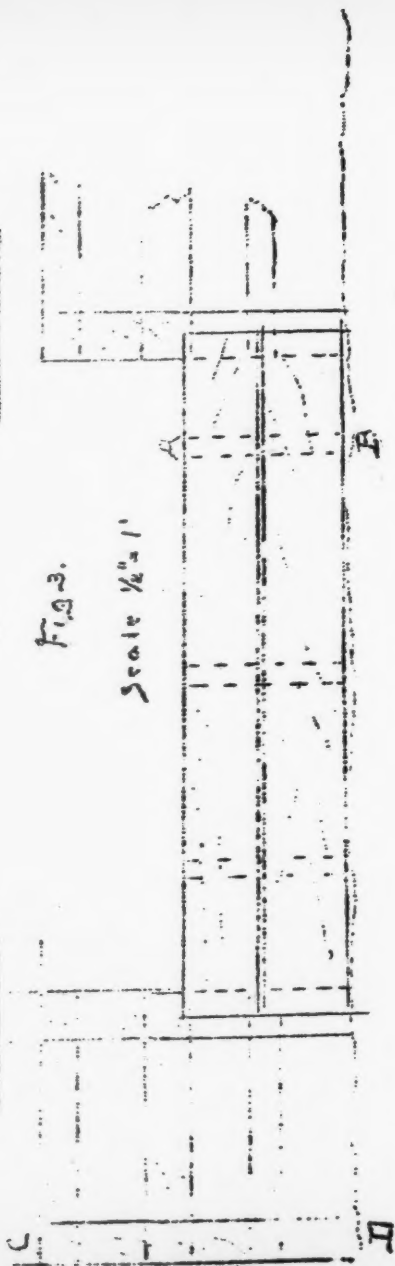


Fig. 3.

Scale $\frac{1}{4}'' = 1'$



over, and the place of jumping easier than adjoining parts. In Fig. 3 a form is given which is used at a few posts, and has been found good. It consists of a solid hurdle, triangular in cross section, and from a foot and a half to two feet in height. A slot is cut in each end of the hurdle, and wing fences inserted, as shown. Bars may be placed on pins in the holes shown, and the hurdle raised as desired, but it must never be made higher than the wing fences. A horse approaching this hurdle recognizes that he cannot turn it over, he cannot step over it, and it is better to jump it than attempt the wing fences.

S. D. ROCKENBACH,
Second Lieutenant, Tenth Cavalry.

BOOK NOTICES AND EXCHANGES.

Books received and to be noticed in next number of the JOURNAL:

RIDERS OF MANY LANDS. By Colonel Theodore Ayrault Dodge, U. S. Army.

MODERN AMERICAN PISTOLS AND REVOLVERS. By A. C. Gould (Ralph Greenwood). Illustrated.

MAXIMS FOR TRAINING REMOUNT HORSES FOR MILITARY PURPOSES. By J. Y. Mason Blunt, Lieutenant Fifth Cavalry, U. S. A.

ANNUAL REPORT FOR 1893 ON THE U. S. CAVALRY AND LIGHT ARTILLERY SCHOOL, FORT RILEY, KANSAS. Colonel James W. Forsyth, Seventh Cavalry, Commandant.

THE PRINCIPLES OF STRATEGY. Illustrated mainly from American Campaigns. By John Bigelow, Jr., Captain Tenth Cavalry, U. S. Army. Second edition, revised and enlarged.

MILITAER-WOCHENBLATT. 1894.

No. 1: Comments on Prince Frederick Charles in the work "The War on the Loire." Charleston 1860-1865. Limits of Age in the French Army. No. 2: Comments on Prince Frederick Charles (continued). French Siege Artillery. Reorganization of the Swiss Army. No. 3: History of Uniforms of the Army under Frederick William the Third. The Infantry Attack. No. 4: History of Uniforms under Frederick William the Third (concluded). Drill of Reserves in France. No. 5: The Infantry Attack (continued). Sanitary Regulations for the German Navy. Maneuvers of the Second and Sixth French Cavalry Divisions. No. 6: Comments on Napoleon I. Infantry Attack (continued). No. 7: The Shortest Route to Constantinople. Infantry Attack (concluded). No. 8: Bayreuth Dragoons and General Chasot. The First Cavalry Division in the Battle of

Beaune la Rolande, November 28, 1870. No. 9: Cabinet Order as to Reduction of Infantry Pack. No. 10: Our Infantry Tactics of To-day. Foreign Comments on Great Initial Velocities and Rapid Firing Guns for Field Artillery. Grand Maneuvers of the French Army in 1894. No. 11: Register of the Saxon Army for 1894. Our Infantry Tactics of To-day (continued). The French Army at the End of the Year 1893. A New Russian Ammunition Cart. No. 12: A Few Words on the Third Corps at Beaune la Rolande. Our Infantry Tactics of To-day (concluded). Foreign Comments on Great Initial Velocities and Rapid Firing Guns for Field Artillery (concluded). No. 13: Retrospects on the Training of Infantry. The New Italian Minister of War and His Program. Victory of the Italian Colonial Troops over the Dervishes at Agordat. The Field Artillery of the United States. No. 14: Metz Defended by Armored Fronts.

REVUE DU CERCLE MILITAIRE, 1894.

No. 2: Russian Winter Maneuvers. No. 3: The Future of Chili and Her Army, by a Russian Officer. Summer Dress for German Officers. No. 4: The Subsistence of the French Army in War. No. 5: The Railway System of Russia. The Subsistence of the French Army in War. No. 6: French Military Operations in the Soudan (with map). The Flying Machine of Prof. Wellner (with plate). No. 7: The Military Career of Prince Bismarck. Italian War Dogs. No. 8: The Railway from Senegal to the Niger (with map). Maneuvers of the Hospital Corps. No. 9: The Target Practice Schools. The Lightening of the German Soldier's Equipment. No. 10: Timbuctoo. The Sea Route from Europe to Siberia.

THE UNITED STATES SERVICE. Hamersly & Co. 1894.

January: The Soldiers' Aid Society, by Caroline Frances Little. February: American Men for the American Navy, by F. M. Bennett, Passed Assistant Engineer, U. S. Navy. A Cavalry Surgeon's Experience in the Battle of the Wilderness, by Augustus P. Clarke, M. D., Surgeon and Brevet-Colonel, U. S. V. March: Our Sister Republics, by John P. Wisser, First Lieutenant First Artillery. April: The Reorganization of Our Army, by W. A. Campbell, Second Lieutenant Ninth Infantry. About Hunting and Snakes, by W. B. Lane, Brevet Colonel, U. S. Army. The Colored American as a Soldier, by T. G. Steward, Chaplain Twenty-fifth Infantry, U. S. A. The Secretary of War, Daniel Scott Lamont, by Charles Robinson.

JOURNAL OF THE UNITED SERVICE INSTITUTION OF INDIA.

October 1893: Mountain Warfare as Applied to India, by Captain F. C. Carter, D. A. A. G. Allahabad District (with numerous maps). November, 1893: The War Game on the Model, by Captain H. A. Bethel, R. A. (with maps and plans). Report on Swimming Instruction as Carried Out by the Ninth Bengal Lancers

(with plate of various kinds of rafts used). Cavalry Maneuvers, by Lieutenant-Colonel P. Nevette, Fourteenth Bengal Lancers (with numerous plates).

JOURNAL OF THE MILITARY SERVICE INSTITUTION.

Organization of the Armies of Europe, by Captain O'Connell.
The Q. M. Department, by Lieutenant-Colonel Lee.

THE PENNSYLVANIA MAGAZINE OF HISTORY AND BIOGRAPHY. Vol.
XVII. No. 4.

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No. 4.

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THE WESTERN SOLDIER. Monthly. San Francisco, Cal.

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THE RIDER AND DRIVER. Weekly. New York.

OUR ANIMAL FRIENDS. Monthly. New York.

OUR DUMB ANIMALS. Monthly. Boston.